ANAESTHESIA FOR TONSILLECTOMY*

BY

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This paper is a short account of the several anaesthetic techniques used in over 1,000 cases of tonsillectomy at Glasgow Ear, Nose and Throat Hospital during 1948–1953. The subject falls naturally into two parts:

I. Anaesthesia for the removal of tonsils and adenoids in children (860 cases); and

II. Anaesthesia for dissection of tonsils in adults (151 cases).

In each case the anaesthetic technique varies with the operative requirements, themselves a variable factor, especially in the child.

IN CHILDREN

Operative Requirements.

In the cases of this series, tonsillectomy in children was carried out by one of three methods, the main difference between them from the anaesthetist’s point of view being one of duration, thus:

(1) The Sluder-Ballenger guillotine.

(2) The Layton tonsil enucleator (screw guillotine).

(3) The dissector and snare.

Divergent views (not unrelated to the anaesthesia) are expressed by throat surgeons as to the respective merits of these procedures. Thus McLaggan (1937) states: “Dissection gives uniformly better results, principally because it requires the administration of an anaesthetic which is prolonged until the operation is completed to the satisfaction of the surgeon.”

He describes guillotine enucleation under ethyl chloride as “a hit or miss procedure,” and goes on to say: “even in the hands of expert operators and anaesthetists there is a percentage of incomplete operations, usually due to anaesthetic difficulties. This percentage rarely falls below 10 and is entirely unjustifiable. . . . The greatest objection to the guillotine method is lost when a prolonged ether anaesthetic is given.” On the other hand, this sweeping condemnation of the use of the guillotine is countered by Turner (1952) who described its use in children anaesthetized with 3–5 ml. of ethyl chloride from a Guy’s inhaler.

In the present series, 819 children were anaesthetized for removal of tonsils and adenoids. In over 90 per cent of cases the guillotine or enucleator was used and ethyl chloride was the main anaesthetic agent. Only 2 cases returned for removal of tonsil tags. One could not be dogmatic about this figure, however, since the cases were not normally seen later than two weeks post-operatively.

Even in the small number of cases where the dissector and snare were used the surgeon was usually able to complete his work satisfactorily within the short period

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of anaesthesia provided by a single dose of ethyl chloride in the average child of 5–6 years. In 73 cases, however, where it was anticipated that rather more anaesthetic would be necessary, usually in bigger children (up to 14 years) supplementary ether was added.

Although the operation is of such short duration, deep anaesthesia with good muscular relaxation is essential to success for three reasons: (1) The masseters (powerful muscles, even in the child), the medial pterygoids (which work at a great mechanical advantage) and the temporal muscles must be well relaxed to allow easy atraumatic insertion of the gag (preferably Jenning’s). (2) The palato-glossus m. (in the ant. pillar), the palato-pharyngeus m. (in the post. pillar of the fauces) and sup. constrictor m. of the pharynx (which lies deep to the tonsillar bed) must all be relaxed to allow the entire tonsil to be easily squeezed into the ring of the guilotine. (3) The pharyngeal reflex must, of course, be abolished.

The final and probably the most important requisite is an immediate return of the cough reflex on completion of the tonsillectomy and before adenoidectomy is begun. If the patient is too deep at this stage, the surgeon should wait (having placed a swab in each tonsil bed) until the anaesthesia lightens sufficiently before removing the adenoids.

Thirty-nine cases of adenoidectomy alone are included in the present series, for the anaesthetic technique is similar, although less exacting. All that is required here is sufficient relaxation of the jaw for the insertion of the gag, as the operation is over in a few seconds. At the same time, palatal and pharyngeal movement should not be too vigorous while the curette is being used, lest damage occur to Passavant’s bar—that part of the superior constrictor which forms a sphincter with the soft palate. In most cases, the St. Clair Thomson curette was used, but the La Force Adenotome was preferred in some. Trivial as this operation may be, Thomson and Negus (1937) reported that “No inconsiderable number of deaths during this operation have been recorded, and almost every one attributable to the anaesthetic.” There were no deaths in this series.

**Anaesthetic Technique.**

The question of premedication for these children has received much attention. Atropine gr. 1/100 (0.65 mg.) is, of course, essential, not only to prevent the copious secretion of mucus by the child, but in order to protect against primary cardiac failure due to vagal stimulation.

Opinions differ as to the advisability of giving a sedative in addition—bearing in mind its possible effect on the vital cough reflex. Pentobarbitone or phenobarbitone by mouth has been prescribed, while rectal paraldehyde has been suggested to avoid “psychic trauma.”

Thus Thomson and Negus (1948) advise pentobarbitone gr. ½ per stone (5 mg./kg.) of body weight by mouth, and paraldehyde dr. 1 per stone (0.6 ml./kg.) of body weight per rectum; yet there is a statement in the same paragraph that “the operation is usually performed in the morning so as to give time for recovery before nightfall”! In a previous edition however (Thomson and Negus, 1937) the same authors advised against sedation or basal narcosis. Methylpentynol may prove...
of some value in this respect (Rendell, 1954).

The cases in the present series received atropine only. A skilful nitrous oxide induction, using the hands in place of a face mask (Tindal, 1948) and coupled with the use of suggestion, carries less risk of producing psychic trauma in a child than the administration of any drug per rectum.

Anaesthesia is induced with nitrous oxide, which is then turned off and 3–6 ml. of ethyl chloride with oxygen administered in the familiar Y-piece attachment to the Boyle’s machine.

Almost every child can be coaxed to sleep with nitrous oxide (Pinkerton, 1948). 724 cases were anaesthetized in this way (tables I and II).

### Table I

**Anaesthesia for tonsillectomy**

<table>
<thead>
<tr>
<th>Type of Procedure</th>
<th>No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonsillectomy and adenoidectomy</td>
<td>819</td>
</tr>
<tr>
<td>Adenoidectomy only</td>
<td>39</td>
</tr>
<tr>
<td>Removal of tonsil tag</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>860</strong></td>
</tr>
</tbody>
</table>

### Table II

**Anaesthetics used for tonsillectomy**

<table>
<thead>
<tr>
<th>Anaesthetic agent</th>
<th>In children</th>
<th>In adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl chloride</td>
<td>724</td>
<td>49</td>
</tr>
<tr>
<td>Ethyl chloride and ether</td>
<td>73</td>
<td>38</td>
</tr>
<tr>
<td>Vinyl ether</td>
<td>49</td>
<td>17</td>
</tr>
<tr>
<td>Ethyl ether</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Trichlorethylene and ether</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Chloroform</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>Thiopentone, suxamethonium and trichlorethylene</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>860</strong></td>
<td><strong>151</strong></td>
</tr>
</tbody>
</table>

### Discussion

It has been said, presumably because of its potency, that the safest way to administer ethyl chloride is on an open mask.

The method described is preferable for the following reasons:

1. Nitrous oxide is a safer agent with which to induce anaesthesia than is ethyl chloride.
2. Re-breathing of CO₂ in the closed system makes for a quicker and therefore safer induction.
3. A small and accurate dosage is possible only by this method—or by some form of vaporizer, such as that described by Bromage (1950); it is thus practically impossible to administer an overdose.
4. The high oxygen atmosphere counters any tendency to laryngeal spasm. But ethyl chloride, however administered, has a high Coefficient of Partition and is not without effect on the cardiovascular system: there is some direct depression of the myocardium and increased irritability of the conducting mechanism; the cardiac output may be decreased and the blood pressure fall steeply. While these effects result in very satisfactory operating conditions, they can hardly be said to be altogether laudable,
otherwise chloroform would be the anaesthetic of choice for this operation!

In looking for a drug with the acknowledged safety of ethyl ether but with a greater speed of induction and excretion, vinyl ether seemed the obvious choice. Forty-nine cases were anaesthetized with this drug using 3–6 ml. by exactly the same technique as that described for ethyl chloride. Induction was effected even more rapidly, but the duration of anaesthesia achieved was correspondingly shorter, not as a rule exceeding 30 seconds. It was, therefore, suitable for use only with the guillotine. Relaxation was good, while there was generally a little more bleeding which was easily controlled by suction.

Thus nitrous oxide-oxygen-vinyl ether-ethyl ether would appear to be a very safe anaesthetic sequence for this operation, providing good relaxation for 2–3 minutes.

Ethyl ether itself was used in 14 cases where an even longer anaesthetic was required. With this drug anaesthesia of 5 minutes duration could easily be achieved by the single dose technique. Accurate timing of the premedication is essential.

If the child's nasal airway is poor, a small oro-pharyngeal airway should be inserted as soon as possible.

**Immediate Post-Operative Period.**

As soon as the naso-pharynx is cleared of adenoids the child is turned on to his left side and the face doused with cold water. Close observation during the immediate post-operative period is an integral part of the operation, not only to ensure that he has fully recovered his cough reflex but also (and some surgeons stress this) to see that bleeding is minimal. The use of the sucker during operation is, of course, literally a vital procedure. The lateral position is maintained during transit to ward and bed. Post-operative sedation is limited to ac. acetylsalicyl, gr. 5 (320 mg.) crushed in a little orange juice, or Nepenthe, 1 minim (0.06 ml.) per year, similarly administered.

**IN ADULTS**

Dissection of tonsils in the adult may be carried out under local or general anaesthesia.

**Local Anaesthesia.**

In the present series of cases this technique has not been employed on account of the following disadvantages (Hewer, 1953):

1. "There now seems small reason for subjecting patients to a technique which at best can only be described as unpleasant."
2. It is unsuitable for fibrotic tonsils.
3. There is an increased risk of sepsis; in one series of deep cervical infections following tonsillectomy over 90 per cent of cases were found to have had local anaesthesia.
4. Pulmonary complications are also commoner following local anaesthesia.

**General Anaesthesia: Operative Requirements.**

Dissection of tonsils including the use of the Boyle-Davis gag is almost the universal practice in the adult. This requires 20–30 minutes anaesthesia by the nasal endotracheal route. The practice of insufflating the anaesthetic gases down the side tube of the gag has little to commend it.
The passage of an endotracheal tube through the nose, however, carries with it certain risks:

1. **Infection** may be carried from the pharynx to the lungs (Dawkins, 1937), or to the nose on extubation, causing adhesions (Dingley, 1943).

2. **Trauma** to the nose, pharynx or larynx may occur even with gentle handling and in the absence of bleeding. Wylie (1950), discussing the hazards of intubation, shows a high incidence of sore throat after intubation in 100 cases—not throat cases (see table III).

<table>
<thead>
<tr>
<th>No. of cases</th>
<th>Absent</th>
<th>Mild</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>30</td>
<td>57</td>
<td>13</td>
</tr>
</tbody>
</table>

Gillies (1953) states that pain originating in the pharynx or trachea following intubation can be avoided by the use of a hygroscopic lubricant such as glycerine on the tube. He also recommends (Gillies, 1951) the use of polyvinyl tubes which soften at body temperature and thus prevent pressure being exerted, for example, by the tip of the tube on the tracheal wall.

Adenoids, too, form a definite hazard during nasal intubation. On this subject Magill (1952) states: "The use of the nasal route (for intubation) in the dissection of tonsils is clearly inadvisable where adenoids are present," and mentions that an oro-tracheal tube may be incorporated in the tongue piece of the Davis gag by a special metal device.

Further, damage may occur to the posterior pharyngeal wall, and a few cases have been recorded of the tube being passed deep to the pharyngeal mucosa (Coffin, 1950). This seems the more likely to occur if the tube is firmly gripped in its passage through the nose and the "feel" of it lost.

Occasional laryngeal granulomata have also occurred following intubation (Gould, 1935).

In a perusal of sundry articles on intubation, one is struck by the lack of reference to the local preparation of the nose. In order to gain as much space as possible in a relatively small cavity, it seems only reasonable to use a vaso-constrictor (and preferably analgesic) preparation such as cocaine 10 per cent and adrenaline 1 in 4,000. This may be sprayed into the nares, or, if considerable difficulty is expected on account of deformity of the septum or turbinates (a not uncommon occurrence), the nose should be prepared with pledge-lets of cotton wool soaked in the above solution. In this connection, the nose will usually have been examined by the surgeon, and his findings on the case sheet often give a valuable clue as to which nostril will prove the more patent.

**Anaesthetic Technique.**

The premedication prescribed was morphia gr. 1/6 (10 mg.) and atropine gr. 1/100 (0.65 mg.)—a compromise. Eighty-seven cases were anaesthetized with endotracheal ether as the main anaesthetic agent, following a nitrous oxide induction (table II). This generally gave good results although the induction took a little time.

In 17 cases chloroform was used in the Boyle's machine. It should be stated at this point that while the practice of dis-
secting tonsils in the adult is now almost universal, one is still occasionally asked to anaesthetize an adult for a guillotine tonsillectomy. If this is to be at all successful, full relaxation of the muscles concerned is essential, followed by a rapid return of the cough reflex. Nitrous oxide, oxygen and chloroform provide excellent operating conditions for this short procedure, which accounts for some of the 17 cases. The remainder were intubated under chloroform and dissection performed.

One of these cases deserves special mention. After intubation and connecting up the apparatus it was noticed that respiration had ceased. The pulse was palpable. The pupils were dilated. The patient was, however, a good colour. One could not say definitely that the heart had stopped (for no time was spent on auscultation) but there was little evidence of its activity. The patient was placed in a steep Trendelenberg position immediately and inflated with oxygen. In just under one minute—it seemed longer—the pupils first became smaller, then the carotid pulse returned. Respiration resumed shortly thereafter and the pulse became full and regular. The patient’s colour remained good throughout. Recovery was uneventful. It is considered that this may have been a case of primary cardiac failure, possibly precipitated by intubation.

The final blow against the use of chloroform, which tends to linger on in anaesthesia for throat surgery, was struck by the advent of the short acting muscle relaxants. The last 47 cases in this series were anaesthetized with thiopentone, suxamethonium (Scoline), nitrous oxide, oxygen and trichlorethylene. In a few cases a little ether was added if the operation was prolonged.

Suxamethonium belongs to that group of muscle relaxants which act by depolarization of the motor end-plate. This produces an initial stimulation and twitching of the muscle before paralysis ensues. In the conscious patient this is a painful process, and even when a small dose of thiopentone has been given, patients have complained of post-operative aching in muscles quite unrelated to the site of operation. The relationship between suxamethonium and muscle pains has been the subject of a recent study (Churchill-Davidson, 1954) which indicated that pain occurred chiefly in out-patients, and that its incidence and severity were reduced by abolishing the fascicular twitching which follows the injection. It would seem reasonable therefore to ‘cover’ the suxamethonium with an adequate dose of thiopentone, say, in the ratio of 10 mg. of thiopentone to each 1 mg. of suxamethonium. The average dose used was 650 mg. of thiopentone followed by 68 mg. of suxamethonium administered from a separate syringe.

After the nose has been sprayed, the patient's lungs are inflated with oxygen; when the jaw is fully relaxed, the tube is passed through the nose and one, or at most, two attempts at “blind” intubation made. Apnoea, if it occurs, is considered no disadvantage during this manoeuvre, as it is a simple matter to decide whether the tube is in trachea or oesophagus by having an assistant squeeze the chest. If the trachea is not readily entered it is considered no disgrace to insert the laryngoscope and introduce the tube under direct vision, using Magill's forceps if necessary. The Boyle-Davis gag is then inserted by the surgeon and the throat packed. The head of the table is now dropped so that the patient's neck is in a position of hyperextension and any blood which escapes the sucker will pool in the naso-pharynx.
If hyperextension is extreme, however, a rubber tube may become kinked over the inter-arytenoid fold.

By the time the surgeon is ready to commence, respiration is usually adequate and trichlorethylene must be brought in early to prevent the patient straining on the tube (which is lubricated with a non-analgesic preparation). The duration of effect of the suxamethonium was found to be 2–5 minutes and no case of prolonged apnoea occurred although a dose of 100 mg. was used in a few cases.

At the conclusion of the operation when haemostasis is effected the surgeon removes his pack. An early return of the pharyngeal reflex is assured by maintenance of anaesthesia on nitrous oxide and oxygen alone during the latter part of the operation. The endotracheal tube is now withdrawn into the pharynx and removed from there with the sucker attached thus catching any blood clot which has accumulated in the naso-pharynx during operation. The patient is then turned on to his left side and returned to bed in that position. Pethidine (100 mg. intramuscularly) is preferred for post-operative sedation.

SUMMARY

The operative requirements and anaesthetic techniques used for tonsillectomy in children and in adults during 1948–53 are described. Whereas in children there has been little change in the anaesthetic technique employed, in adults, on the other hand, this has undergone considerable modification since the advent of the short acting muscle relaxants.

ACKNOWLEDGMENTS

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