RE-ANAESTHETIZING CASES OF TONSILLECTOMY AND ADENOIDECTOMY BECAUSE OF PERSISTENT POSTOPERATIVE HAEMORRHAGE

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SUMMARY
Five hundred and forty-six consecutive cases of tonsillectomy and adenoidectomy that had to be re-anaesthetized subsequently on account of postoperative haemorrhage were examined. There was one death. Some previously published case histories of death and cardiac arrest associated with the procedure are summarized. The dangers inherent in the procedure are discussed and the means whereby they may be avoided are outlined. The importance is stressed of restoring the blood volume to normal, emptying the stomach, if at all possible, and removing all loose clots from the pharynx and postnasal space before induction of anaesthesia, and of using, during anaesthesia, a high concentration of oxygen. A suggested technique of management, based upon personal experience of forty cases is outlined.

The operation of tonsillectomy and adenoidectomy is performed approximately 200,000 times each year in England and Wales (Report on Hospital In-patient Enquiry for the years 1956-57; Report on Hospital In-patient Enquiry for the year 1961). In some of these cases a second anaesthetic is necessary in order to control postoperative bleeding.

The actual mortality associated with a second anaesthetic has not previously been determined but one would expect it to be quite high. In recent reports of death following the operation of tonsillectomy and adenoidectomy, at least one-third of those associated with anaesthesia related to a second anaesthetic; the Committee on Deaths Associated with Anaesthesia (1955) describes three such deaths, Edwards et al. (1956) two, Smith (1959) one, and Tate (1963) four (table I). Similarly, of three cases of cardiac arrest occurring at operation reported by McKelvie and McKelvie (1961) one related to a second anaesthetic (table I). In view of the fact that a second anaesthetic is only rarely given it is clear that the mortality associated with the procedure must be very considerably greater than the mortality of primary anaesthesia.

In order to determine the mortality of the procedure, a very large series of consecutive cases undergoing a second anaesthetic was examined and the number of deaths ascertained. It is suggested that many of the deaths associated with the procedure might be avoided by proper resuscitation and anaesthetic management. The dangers peculiar to the procedure are discussed and a technique found satisfactory in forty cases is described.

MORTALITY
Five hundred and forty-six consecutive case records relating to the administration of a second anaesthetic after tonsillectomy and adenoidectomy at the Royal National Throat, Nose and Ear Hospital, London, were examined. Twenty-five per cent of the total number of cases were adults; 45 per cent of all cases had a second anaesthetic because of bleeding from the postnasal space and the rest because of bleeding from the tonsil bed. Details of anaesthetic techniques employed were insufficiently documented for any useful analysis to be made.

There was only one death associated with anaesthesia in the series (data were checked by the General Register Office to ensure that all deaths had been accounted for).
CASE REPORT

A girl aged 8 years, who gave a history of recurrent attacks of sore throat, underwent tonsillectomy and adenoidectomy. Five days after the operation there was persistent bleeding from the postnasal space. This bleeding continued intermittently for some hours and the patient eventually vomited 500-750 ml of blood and mucus.

Two hours after vomiting the patient was taken to the operating theatre to be re-anaesthetized in order that a pack could be inserted into the postnasal space (no attempt had been made to introduce a pack with the patient conscious). The patient was still bleeding from the postnasal space. The pulse rate was 110 beats/min, but the patient's general condition was said to be good. No blood or plasma was given prior to operation. The stomach was not emptied and no attempt was made to remove clots from the postnasal space.

Anaesthesia was induced with 50 per cent cyclopropane in oxygen, the patient lying supine on the operating table. When consciousness was lost cyclopropane was discontinued and the anaesthetic was continued with oxygen 3 l/min, nitrous oxide 5 l/min and halothane 2.5 per cent. After a few minutes the patient appeared to retch and so was turned into the right lateral position and the head of the table was tilted downwards slightly. About 5 minutes later progression of the anaesthetic was judged to be slow and the respirations shallow. The mouth was tightly shut. The patient was cyanosed and the pulse was irregular and thready. An endotracheal tube was passed but it was impossible to inflate the lungs with oxygen. A suction catheter was passed down the endotracheal tube and some large clots were removed from the trachea and bronchi. It then became possible to inflate the lungs and the patient's colour improved for a while. Shortly afterwards, however, the patient became pallid and the radial pulse was no longer palpable. Cardiac massage was carried out and the heart beat was restarted but the patient eventually died.

Comment.

Cardiac arrest was caused by a period of anoxia occurring in a patient with a considerable blood volume deficit. Anoxia obviously resulted from respiratory obstruction due to blood clots lodging in the trachea and bronchi; the source of these clots was probably the postnasal space, but could possibly have been the stomach and oesophagus. The blood volume deficit of the patient might easily have been 30 per cent of the normal total blood volume. The dangers to the patient could have been considerably reduced had the patient's blood volume been restored to normal and loose clots removed from the postnasal space before induction of anaesthesia, and had oxygen undiluted with nitrous oxide been given during induction of anaesthesia.

The mortality in the series, of one death in 546 cases, reflects a reasonable degree of safety considering the many dangers that are inherent in the procedure. It naturally compares unfavourably with the mortality associated with primary anaesthesia for tonsillectomy and adenoidectomy performed at the same hospital, of one death in 28,700 cases (Davies, 1964).

It is quite possible that the mortality associated with a second anaesthetic is greater throughout the country than in this series considering the frequency with which such deaths have been reported in some recent papers (table I).

INDICATION FOR A SECOND ANAESTHETIC

The decision of whether or not to give a second anaesthetic in any particular case of postoperative bleeding must be made by the surgeon and the anaesthetist in the closest consultation. In each case the dangers inherent in following a conservative line of therapy must be weighed against the dangers that are inherent in re-anaesthetizing the patient. In many cases of postoperative bleeding the bleeding is slight and can be most safely controlled by procedures which do not involve the giving of another anaesthetic—to take, on principle, every case of slight postoperative bleeding back to the theatre for surgical control under an anaesthetic would be to court danger. Some cases of bleeding, however, can be very serious and the giving of a second anaesthetic, so that the bleeding can be adequately controlled, may be a matter of necessity and, perhaps, some urgency—brisk haemorrhage in a small child can lead to exsanguination of that child in an hour.

In the case of a bleeding adenoid bed a postnasal pack can often be inserted in the conscious patient, especially if the single transnasal catheter technique described by Proctor (1960) be adopted. The single death in the above series would have been avoided if a postnasal pack had been inserted without an anaesthetic.

DANGERS INHERENT IN THE PROCEDURE AND THEIR AVOIDANCE

The anaesthetist should be ever mindful of the dangers that are peculiar to the procedure, and should endeavour to use an anaesthetic technique which will, as far as possible, minimize these dangers. In the single death in the above series it is probable that the dangers to the patient could have been considerably reduced by the use of a different technique of management. It is significant that in previous reports of death and cardiac arrest relating to a second anaesthetic described in recent papers, some obvious faults in tech-
### TABLE 1

Details of some previously published case histories of death and of cardiac arrest associated with a second anaesthetic for arrest of haemorrhage from tonsil or adenoid beds.

Obvious faults in technique revealed in the histories are summarized. The cases are from five recent papers dealing with death and cardiac arrest associated with both primary and secondary anaesthesia in tonsillectomy and adenoidectomy.

<table>
<thead>
<tr>
<th>Source</th>
<th>Number of cases of death and of cardiac arrest associated with primary anaesthetic</th>
<th>Number of cases of death and of cardiac arrest associated with a second anaesthetic</th>
<th>Details of some of the cases of death and of cardiac arrest associated with a second anaesthetic for arrest of haemorrhage from tonsil or adenoid beds.</th>
<th>Some obvious faults in technique revealed in the case histories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committee on Deaths Associated with Anaesthesia (1955)</td>
<td>possibly 8</td>
<td>3</td>
<td>Epileptic child aged 6. Described as &quot;pale and weak, with blood in the pharynx&quot;. The pulse rate was 200. No resuscitation was carried out prior to induction of anaesthesia. Anaesthetized with nitrous oxide, oxygen, trichloroethylene and ether. Endotracheal tube passed and blood was aspirated through it. Shortly afterwards the child had convulsions and cardiac arrest occurred.</td>
<td>Failure to resuscitate a very shocked child prior to induction of anaesthesia. Use of nitrous oxide, thus reducing the percentage of oxygen delivered to the patient.</td>
</tr>
<tr>
<td>Edwards et al. (1956)</td>
<td>—</td>
<td>2</td>
<td>Two cases with bleeding tonsill beds. Haemorrhage had apparently stopped, but nevertheless operation was considered so urgent that it took precedence over resuscitation. Deaths occurred from circulatory failure.</td>
<td>Use of suxamethonium in a child.</td>
</tr>
<tr>
<td>Smith (1959)</td>
<td>1</td>
<td>1</td>
<td>Bleeding adenoid bed. Re-anasthetized some hours later using an open mask in the anaesthetic room. Breathing stopped when patient transferred to operating table and patient subsequently died.</td>
<td>Operative treatment possibly unnecessary. Failure to resuscitate the patients prior to induction of anaesthesia.</td>
</tr>
<tr>
<td>Tate (1963)</td>
<td>21 (only 4 case histories given)</td>
<td>10</td>
<td>Child aged 4 with bleeding tonsill bed. Suxamethonium was given and this resulted in the ejection of a large quantity of blood from the stomach some of which was inhaled. The child died 3 hours later. Necropsy revealed much blood in the lungs.</td>
<td>Use of suxamethonium in a child and in the presence of a full stomach.</td>
</tr>
<tr>
<td>McKevie and McKevie (1961)</td>
<td>2</td>
<td>1</td>
<td>Child aged 4, with bleeding tonsill bed. Re-anasthetized using ethyl chloride and ether. Cardiac arrest during intubation.</td>
<td>Use, presumably, of an open mask, resulting in a low percentage of oxygen being delivered to the patient.</td>
</tr>
</tbody>
</table>

Total no. of cases | 32 | 17 |
nique are revealed in the reports in most cases (summarized in table I).

The hazard to the patient's life from re-anaesthetizing a case with postoperative haemorrhage essentially arises from the possible development of anoxia, resulting from respiratory obstruction by blood clots, occurring in a patient with a reduced blood volume. Anoxia occurring in a hypovolaemic patient can lead to cardiac arrest with extreme rapidity. The technique of management should be directed towards restoring the blood volume to normal before induction of anaesthesia, and removing factors which might lead to anoxia during anaesthesia.

In estimating the blood volume deficit, particular consideration should be given to the general physical state of the patient; obvious blood losses should have been measured and recorded (particularly blood lost during the primary operation and that vomited postoperatively) but much of the blood loss may not be overt. A deficit of 10 per cent should be made good if at all possible; a deficit of 20 per cent should not be tolerated. In judging the actual quantity of fluid that should be transfused in children, the clinician should be aware of the average blood volumes expected to be found in normal children in the different age groups (fig. 1).

Respiratory obstruction by blood or blood clots is a hazard that is ever present, especially in children, but the chances of its occurring can be greatly reduced by appropriate management. Obstructing blood clots can come from either the stomach and oesophagus or from the pharynx and postnasal space.

The stomach often contains large volumes of blood and clots and, if feasible, an attempt should be made to remove as much of the stomach contents as possible. Such attempt is not always practicable in a child, but in an adult an oesophageal tube should always be passed into the stomach.

The most likely sources of obstructing blood clots, however, are the tonsil beds and the postnasal space. In the case of a bleeding tonsil bed, large friable clots are usually present on the bed and these should be removed before inducing

![Graph](https://example.com/graph.png)

**Fig. 1**

Average blood volumes of healthy children in different age groups. There is considerable individual variation in the volume but in the majority of cases this lies between plus or minus 20 per cent of the average figure (approximately between lines AB and CD). Partly after Russell (1949).
anaesthesia. In the case of a bleeding adenoid bed a very large blood clot can often be seen hanging down into the pharynx from the post-nasal space: it is a great potential danger and must be removed.

Should respiratory obstruction occur, then the development of anoxia will be markedly delayed if induction and maintenance of anaesthesia has been carried out with a gas mixture containing not less than 90 per cent oxygen. Nitrous oxide should never be used as this will greatly reduce the percentage of oxygen delivered. For the same reason anaesthesia should never be induced by using ether on an open mask, as in such a technique, quite apart from the occurrence of laryngeal spasm, the percentage of oxygen delivered to the patient may be surprisingly low; Faulconer and Latterell (1949) studying arterial oxygen saturation during open drop ether recorded saturations as low as 70 per cent.

All adults should be intubated with a cuffed orotracheal tube, mainly to guard against inhalation of remaining stomach contents. The situation is different in the case of children because if regurgitation of stomach contents occurs during operation the patient can be easily and quickly turned upside down. In fact, intubation in children may have very real dangers especially if it is attempted or performed in a light plane of anaesthesia, as intractable respiratory spasm may then be induced which may resist all attempts that are made to inflate the lungs. This would be of little importance if the blood volume was normal and the oxygen tension in the lungs high, but should there be an associated blood volume deficit and a relatively low oxygen tension in the lungs then the short period of apnoea could be disastrous. It is probable that such circumstances were responsible for at least one of the cases of cardiac arrest recorded in the literature (table I).

RECOMMENDED TECHNIQUE

The summary is based upon personal experience of forty cases re-anaesthetized because of post-operative haemorrhage.

Pre-operative regime.

As soon as a case of postoperative haemorrhage is reported, a blood sample must be taken from the patient and immediate cross-matching of bank blood undertaken. The patient must be assessed by the surgeon and the anaesthetist in close consultation. If it is decided to re-anaesthetize the patient then the blood volume must be restored to normal before induction of anaesthesia. Practically every case that is to be anaesthetized will require some replacement therapy; if the blood volume deficit is small, plasma can be given, but if the deficit is large, whole blood must be used.

Setting up an intravenous infusion in a child is not always easy but it is usually possible to introduce a needle, even if sometimes only a small one, into a vein on the back of the hand. Because of the importance of replacement therapy and the relative difficulties of performing this in a child, the anaesthetist should be prepared personally to hold the needle in place in the vein until the whole of the infusing fluid has been given. If it has been necessary to use a small needle then an assistant may have to apply positive pressure to the infusing fluid. If it has been found impossible to introduce a needle into a vein and the blood volume deficit is large then a cut-down drip will be necessary.

After the blood volume deficit has been made good it is probably advantageous to dismantle the drip before commencing to induce anaesthesia.

An attempt should be made to empty the patient’s stomach as this may well contain large quantities of blood and clots. As has already been said, it is not always possible to accomplish this in a child. Every adult, however, must have a 6 mm or preferably 7 mm (10 or 12 gauge respectively) oesophageal tube passed intranasally into the stomach and the contents aspirated. Such a tube is not likely to remove all the blood and clots from the stomach but, in practice, if efficient suction is used, large volumes of bloody fluid can, almost invariably, be aspirated and the danger to the patient consequently very considerably reduced.

All loose clots on the tonsil bed and hanging down from the postnasal space should be removed with forceps immediately before induction of anaesthesia: this procedure is absolutely essential.
Induction and maintenance of anaesthesia.

The patient should be supine on the operating table and the table should have a moderate head-down tilt. A rigid theatre discipline is essential. Two assistants are necessary: one by the side of the patient ready to turn the patient into the lateral position should vomiting occur, and one at the head of the table to hold a sucker. The sucker should be of wide bore, without constrictions, and should have a catheter attached to its end; it should be constantly turned on and frequently used during the induction period to keep the postnasal space and the pharynx clear of blood and clots.

Halothane is probably the anaesthetic agent of choice for induction because it allows a very high percentage of oxygen to be delivered to the lungs, is rapid in its action, does not cause laryngeal spasm and does not provoke vomiting. It could be argued that halothane, because of its possible hypotensive action, is not ideal for use in patients in whom a relative hypovolaemia may exist (although every attempt will have been made in all cases to restore the blood volume to normal before induction of anaesthesia, there will always be the risk that some patients with a blood volume deficit will be anaesthetized). Survival experiments on dogs have shown, however, that in states of severe hypovolaemia and hypotension halothane anaesthesia is no more deleterious than ether provided the inspired oxygen concentration is at least 30 per cent (Freeman, 1962). The results of these experiments may not be directly applicable to man but, it is felt, nevertheless, that any possible disadvantage halothane might have in this respect is more than outweighed by its many advantages.

Induction of anaesthesia in children is accomplished using 4 per cent halothane with 96 per cent oxygen (initially by playing a stream of the gases on to the child’s face). Anaesthesia is maintained by an insufflation technique utilizing ether or halothane and the same high percentage of oxygen. When the Boyle-Davis gag is in place it is probably best for the anaesthetist to hold the handle of the gag throughout the operation, thus allowing him to maintain a patent airway at all times and enabling the child to be turned upside down without any delay should vomiting occur.

A cuffed orotracheal tube should be passed in adult cases. Induction and intubation should be carried out using an inhalational technique, the patient inhaling 4 per cent halothane with 96 per cent oxygen. Induction and intubation using thiopentone and suxamethonium, with the patient in a foot-down position, cannot be regarded as accepted practice; in adult cases, however, when the patient has been very fully resuscitated, has had the stomach decompressed, and has had all loose clots removed from the pharynx and post-nasal space, it is possible that this technique may have much to commend it.

ACKNOWLEDGMENTS

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REFERENCES


CAS DE RENOUVELLEMENT DE L’ANESTHÉSIE
LORS DE TONSILLECTOMIES ET ADÉNOIDECTOMIES PAR SUITE D’HÉMORRHAGIES
POSTOPÉRATOIRES PERSISTANTES

SOMMAIRE
546 cas consécutifs de tonsillectomie et d’adénoïdectomie anesthésiés une seconde fois en raison d’hémorragies après l’intervention chirurgicale sont passés en revue par l’auteur, qui rappelle quelques cas précédemment publiés de décès et d’arrêt du cœur. L’auteur lui-même eut un décès. Il discute les dangers de la procédure ainsi que les moyens par lesquels on peut les éviter, signalant en particulier l’importance de la restitution ad integrum du volume sanguin, de la vidange, si possible, de l’estomac, de l’évacuation de tous les caillots du pharynx et de l’espace du fond nasal, avant de recommencer l’anesthésie et enfin la nécessité de donner pendant l’anesthésie une forte concentration d’oxygène. L’auteur décrit une technique basée sur son expérience personnelle de 40 cas.

RE-ANÄSTHESIERUNG WEGEN PERSISTIERENDER POSTOPERATIVER BLUTUNG NACH TONSILLEKTOMIE UND ADÉNOIDEKTOMIE

ZUSAMMENFASSUNG

BOOK REVIEW

Cardiac Arrest and Resuscitation, By B. B. Milstein.

It is difficult to believe that a better book in the English language has been or will be produced on this topical subject.

“The purpose of this book is to make widely known the action to be taken when the emergency occurs”, writes the author on page 15. It certainly does that, but, of course, it goes very much further. It is far more than a first-aid manual, for in its pages will be found splendidly comprehensive accounts of not only the pathology and aetiology of cardiac arrest, but also its prevention and diagnosis. Every aspect of the subject is covered, including the special problems of resuscitation in the newborn infant.

The author does not limit himself to consideration of the immediate emergency and its treatment, but follows up the patient and reviews the post-emergency handling of the patient and here gives an excellent account of the pathology and handling of anoxic brain damage.

In brief, this volume, very reasonably priced for what it offers and in view of its pleasant typescript and excellent illustrations, is highly recommended for purchase by all doctors. It is an absolute “must” for anaesthetists, cardiologists and cardiac surgeons.

Cecil Gray.