GUILLOTINE TONSILLECTOMY AND CURETTAGE OF ADENOIDS UNDER ETHYL CHLORIDE ANAESTHESIA

BY

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This paper had been completed before the recent correspondence on the guillotine operation appeared in the *British Medical Journal*. This correspondence confirms our impression of the misunderstanding which exists concerning the guillotine operation and the anaesthesia required for it.

The published objections to the operation for removal of tonsils and adenoids in children by guillotine and curette under ethyl chloride anaesthesia would lead one to suppose that it was a thoroughly unsatisfactory procedure. This conclusion is entirely at variance with our experience; we here attempt to explain why this should be so, and why these objections should have gained such wide currency. In addition, we examine the suitability and safety of ethyl chloride as an anaesthetic agent for this operation.

Introduction

Removal of the tonsils is an extremely old operation, and is believed to have been practised before 53 B.C. It is, however, difficult to suppose that complete enucleation was often achieved, or that any definitive operation was possible before the introduction of anaesthetics. Nevertheless, in view of the technical difficulties (apart altogether from any considerations of humanity), it is worth noting that removal of the tonsils and adenoids in children entirely without anaesthesia has been not only practised but actually recommended, both in this country (Sydenham, 1935) and in Egypt (Shaheen, 1935), a mere twenty years ago.

Nowadays tonsillectomy is performed either by planned dissection or with the guillotine. Either method may be used in children, except in the presence of peritonsillar fibrosis, where, as in adults, dissection is by universal consent the correct procedure. Waugh (1909) drew attention to the poor standard of work being done with the guillotine, and recommended dissection. More recently Jobson (1942) gave what we believe to be the correct answer—namely, "... undoubtedly a great deal of bad work is done with the guillotine ... [but if] Sluder can produce 99.6% of complete enucleations, the method cannot be at fault." Throughout the intervening years the controversy over the respective merits of the two procedures has been bitter; but it is not our purpose to argue in favour of the superiority of one or other. We are concerned merely to record our impressions of what we regard as a satisfactory operation.

Technique

We have used the guillotine operation extensively in children up to the age of about 14 years, except, of course, in those with obvious peritonsillar fibrosis, and the details of the technique employed are as follows.

The only pre-operative medication administered is atropine sulphate, 1/100 gr. (0.65 mg.) injected subcutaneously about 45 minutes before operation. The gag is not inserted before beginning the induction of anaesthesia.

The child is "coaxed" to sleep with nitrous oxide from a Boyle's machine, while the anaesthetist simultaneously utters simple phrases of explanation and reassurance. The mask is applied to the face only when unconsciousness has supervened, and a little oxygen is then admitted. After a few further breaths the nitrous oxide is turned off, and some 5–10 ml. of ethyl chloride is introduced gradually into the breathing-tube. The anaesthetist indicates that the depth of anaesthesia is suitable by raising the child's head and shoulders, while a nurse removes the mask with one hand and places a small sandbag under the shoulders with the other. The surgeon now inserts the gag on the left side and opens the mouth. From this point on, the anaesthetist controls the gag with his left hand, and with his right he modifies the position of the head from moment to moment to suit the manœuvres of the surgeon.

The surgeon next introduces the guillotine and removes each tonsil in turn, the anterior faucial pillar being gently pushed off the tonsil by one or more partial closures of the blade before the guillotine is fully closed. Each fossa is then inspected and palpated. The adenoids are then removed, the curette being introduced as often as is necessary to achieve complete removal. The child is turned over on its right side, the throat is mopped out and reinspected and the gag is removed. The chin is pushed forward routinely lest, as sometimes occurs, the temporo-mandibular joints should have been subluxated.

The patient's face and neck are liberally sponged with cold water; and finally, when the protective reflexes have manifestly returned and the bleeding has abated, the child is carried back to the ward head down, and placed in bed in the lateral or semi-prone position.

Discussion

Certain aspects of this procedure merit some discussion.

1. Pre-anaesthetic Sedation.—We believe that the dangers (Jackson, 1951) of administering pre-operative sedatives to children have been exaggerated; and we are not opposed in principle to their rational use (Anderson, 1952) in order to achieve a carefully judged effect. However, children thus sedated may exhibit post-operative somnolence and later restlessness, demanding a degree of continuous individual attention for a variable period. We feel that the necessity for sedation can be virtually eliminated if the children are handled at all stages with a sensible mixture of tact and frankness, and if, above all, they are subjected to a considerate induction of anaesthesia.

2. Anaesthesia.—The considerate induction referred to is provided by nitrous oxide and oxygen, as described above, since we agree with Bromage (1950) that it is "... more acceptable to the apprehensive patient than the most humane ethyl chloride induction." The nitrous oxide/oxygen/ethyl chloride sequence has been described before in various forms by Westell (1941), Minnitt and Gillies (1948), and Bromage (1950), among others. We have found that the great majority of children accept it almost without a murmur, though the amount of encouragement and persuasion required varies considerably. A few are a little tearful, but if sufficient patience is exerted none need be terrified. This picture presents a happy contrast to scenes which many doctors must recollect with distaste. Though it may seem obvious, it is worth pointing out that the dose of ethyl chloride for any given child is that amount which is required to produce the desired level of anaesthesia. There is no standard dose, and it is wise to have available rather more than is thought will be necessary. There are three main grounds for advocating a pleasant induction:

(a) All creatures have the right to expect that unpleasant procedures to which they have to be subjected in their own interests shall be made as tolerable as possible. This applies with even greater force to children than to adults, in that the former are more vulnerable because of their immature level of understanding, and because they are of necessity less able to protest effectively against callous handling.

(b) Many authors—for example, Burstein (1953) and Capon (1954)—have called attention to the psychic trauma which may follow crude induction of anaesthesia in children. Jackson (1951) cites night terrors, temper-tantrums, destructiveness, and increased fears. Gorham (1935) wrote: "... children may change in character ... becoming nervous, irritable and waking up at night screaming ... in some cases these symptoms last a week or two, in others as long as nine months. Nocturnal sedatives have had to be administered for quite long periods." Deming (1952) believes that the normal emotional growth of children may be disturbed by fears, obsessions, and regressive behaviour resulting from unpleasant anaesthetic encounters.

(c) No doubt large numbers of normal well-balanced children who are subjected to disagreeable experiences escape actual psychic trauma, but it is evident that a persistent fear of hospitals and everything connected with them may result. The development of such an attitude, which at best prejudices adjustment to the crisis of illness and at worst endangers life itself—for example, in cancer (Aitken-Swan and Paterson, 1955)—must be countered by every possible measure.

As well as fulfilling the foregoing psychological criteria, the method described provides for the immediate and continuous availability of oxygen. The importance of avoiding anoxia in all circumstances, and particularly in the presence of a potentially toxic agent such as ethyl chloride, has been repeatedly stressed, and is now very widely appreciated (Bird, 1930; Bromage, 1950). It is disturbing to learn that the use of oxygen with ethyl chloride has been deprecated on the ground that it was responsible for a prolonged and turbulent induction (Kingsford, 1930).

3. *Use of Gag.*—The gag is inserted after the child is anaesthetized, because the conscious child dislikes the presence of a gag in the mouth—it is puzzling and frightening, and it hinders the accomplishment of a smooth induction. Also, it is often dislodged deliberately or inadvertently in early anaesthesia; and if not, teeth may be loosened or damaged if the jaws are clenched in the second stage. We have, in any case, never encountered any difficulty in introducing it after the required depth of anaesthesia has been attained. It is well known that spasm of the masseters may occasionally persist even in deep ethyl chloride anaesthesia. In this event, a combination of sustained downward pressure on the chin and counter-pressure on the forehead is employed to separate the teeth enough to permit insertion of the gag, which is then opened, assisted if necessary by the pressure of the surgeon's forefinger and thumb on the lower and upper incisors respectively.

4. *Inspection.*—Should the final inspection show, if ever, that a remnant has been left, anaesthesia is resumed with nitrous oxide, oxygen, and ether or trichlorethylene by insufflation through the side-tube of the Boyle-Davis gag, or (preferably) through a nasotracheal tube; and the surgeon then dissects out the remnant.

5. *Recovery.*—The use of cold water slightly accelerates recovery from the anaesthetic by reflexly stimulating the respiration. It is also thought to hasten the arrest of bleeding, probably by inducing reflex vasoconstriction.

Classical Objections Considered

The following selection is representative of the objections of the very numerous authors who have recorded their disapproval of the guillotine operation (the italics are ours throughout).

Sharp (1952) sums up thus: "The guillotine, in the hands of experts, usually results in a satisfactory removal of large pedunculated tonsils, but the buried fibrotic tonsils present difficulties, and removal of them results in damage to the pillars of the fauces; the *necessarily light anaesthesia* generally employed gives little time for a deliberate and considered removal of the adenoids." He also remarks that, while the dissection method is the more leisurely procedure and is the operation of choice, it must be undertaken with the co-operation of an *experienced anaesthetist*.

McKenzie (1951), discussing the question "Dissection or guillotine?" remarks that there are failures with both methods, but that poor results due to the guillotine are the more common. He goes on to give a graphic description

of how they occur: "Most people are right-handed, and they seize the guillotine in their right hand, so that the right tonsil is removed first. The mouth now fills with blood, the patient may be *lightly anaesthetized* and cough repeatedly, and the left tonsil is hard to grasp. In consequence, a tonsil remnant is more likely on the left side." This is indeed a terrifying picture.

Atkinson (1942) is even more dramatic: "... hurried manipulations terminating in a rising tide of blood. ... The *lightly anaesthetized* patient is turned over, and, against a tightening barrier of resistant palatine muscle, the curette is forced into the nasopharynx. ... The adenoids become a concluding gesture in a welter of blood and confusion."

Laurence (1942) states: "... one should use an anaesthetic which permits one to do all that one wants to do." But he considers that ethyl chloride emphatically does not fulfil this specification.

Scott Stevenson (1952), comparing the two methods, considers that, though the dissection method possesses the greater advantages, it is not easy, takes longer, and requires a longer and *deeper anaesthesia*.

The criticisms embodied in these views may be grouped under two headings:

(1) That it is difficult to be certain of removing the tonsils completely, especially if they are buried or fibrotic; and that the faucial pillars and the palate may be damaged in the process. We have not found this to be so, but we have no doubt that if the guillotine is used routinely there will be failures attributable to peritonsillar fibrosis. From the description of our procedure it should be evident that there is ample time for the careful removal, inspection, and palpation mentioned. The other essential, if the peritonsillar tissues are to escape damage and easy access to the adenoids is to be provided, is that the musculature of the faucial pillars and soft palate be well *relaxed*—and this leads to the second group of objections.

(2) That the supposedly inevitable lightness of the anaesthesia, by providing inadequate muscular relaxation and compelling the surgeon to hurry, increases the hazards mentioned under (1) and impedes access to the adenoids. We are driven to conclude from the opinions previously quoted that the respective authors have based their views on the efforts of anaesthetists inexperienced in the use of ethyl chloride.

The guillotine operation is often regarded as a trivial one, and until quite recently the anaesthesia was commonly entrusted to the most junior member of the surgical team. He usually approached his task with reluctance and fear. The only positive element in his attitude was a vague but correct belief in the potency of the agent. Consequently it became his fixed resolve to brave the surgeon's annoyance at an inadequate anaesthesia rather than to run the slightest risk of the fatal result which he dreaded. Conversely, an occasional death may be attributable to a perverse determination in the opposite sense. Thus, we interpret the prevalent dislike of the guillotine operation as being largely an oblique protest against the inexpert anaesthetist.

It cannot be too strongly emphasized that, far from being light, the anaesthesia must, on the contrary, be *deep*—a little deeper initially than the average depth of the anaesthesia for the dissection operation. The coughing and swallowing reflexes must be suppressed and the pharyngeal and palatal musculature fully relaxed to permit deliberate surgery. Further, with an agent such as ethyl chloride, which is highly volatile, and rapid both in its action and in its elimination, the *duration* of anaesthesia is closely related to the *depth* attained by the time the mask is removed. Thus, apart from providing the necessary relaxation, a reasonably deep anaesthesia assists the surgeon by allowing him longer operating time.

Moreover, is expert anaesthesia so essential for the dissection operation? Certainly, the more experienced the anaesthetist the better—but sometimes a choice has to be made. If so, we believe that the more experienced anaesthetist should be allotted to the guillotine operation, and

the less experienced for the dissection. A competent E.N.T. surgeon can help a novice anaesthetist who gets into difficulties with an endotracheal tube; and if at any time during the operation the level of anaesthesia becomes too light he can stop and wait for a minute or two until the situation is corrected. Such delays may be irksome, but they do not jeopardize the essential success of the procedure. With the guillotine operation, however, the situation is reversed. The services of an expert anaesthetist can be used to imbue a trainee surgeon with confidence by allowing him to concentrate entirely on the surgical aspects and by safely providing adequate operating-time.

Estimates of the time required for guillotining the tonsils and curetting the adenoids, and also of the time which the single-dose administration of ethyl chloride provides for the operation, vary considerably. Thus, for the operation, times as short as 30 seconds (Shaheen, 1935) and 40 seconds (Newell, 1930) are declared to be ample. Bird (1930), on the other hand, estimated his average operating time at 115 seconds, and did not find this restricted by the anaesthetic technique. Others (Atkinson, 1942; Laurence, 1942) consider that ethyl chloride cannot be relied on to provide enough time for satisfactory surgery.

We find that the surgeon has an average time of about 90 seconds at his disposal, and that this is long enough for a trained operator to accomplish his task in comfort. If the surgeon so requests, the anaesthesia can be deepened more than usual before removing the mask, and the operating-time thereby safely increased to at least two minutes.

Dangers of Ethyl Chloride

Warning of the dangers of ethyl chloride are numerous. Thus, an authoritative textbook of pharmacology (Goodman and Gilman, 1941) states: "... although ethyl chloride is less toxic than chloroform, ventricular fibrillation and sudden cardiac arrest may occur." Stirling (1954) considers that atropine is essential to protect against primary cardiac failure due to vagal stimulation. Leigh and Belton (1946) recommend "adequate premedication" with atropine, but it is more than doubtful if their scheme of dosage fulfils their own criterion of "adequacy."

From recent experimental and clinical studies (Virtue and Pierce, 1951; Bush, Bittenbender, and Adriani, 1952) we conclude that, although these statements are probably applicable to the dog, they cannot be regarded as proved for human subjects. Even in light *chloroform* anaesthesia, the protective role of atropine is doubted (Clark, 1952).

It must be assumed that ethyl chloride has been commonly administered to patients who have not had atropine, or who have had it in theoretically inadequate dosage. Series of 40,000 (Sington, 1930), 30,000 (Hewer, 1930), and 11,723 (Kingsford, 1930) ethyl chloride anaesthetics without a fatality have been reported. None of these authors stated his views on the role of atropine, and we must therefore conclude that they did not employ it, or that they considered its contribution to safety insignificant.

Since, however, most surgeons regard a dry mouth as essential in tonsillectomy, there need be no further discussion of this point.

Various authors (Jobson, 1942; Macintosh and Bannister, 1947; Minnitt and Gillies, 1948; Deming, 1952) draw attention to the dangers and disadvantages of ethyl chloride, including its depressant effect on the myocardium, the narrow margin between the effective and the lethal dose, the liability of laryngospasm, post-operative vomiting, and liver damage, and its potency and the consequent risk of overdosage. In some schools these considerations have been taken so seriously as to lead to the abandonment of ethyl chloride. We have no doubt that this view is too extreme, but we do not enumerate the risks of ethyl chloride anaesthesia merely to dismiss them—rather to emphasize our point that it should be entrusted only to those who have become skilled in its use through proper training and supervision. With this qualification it has proved in our hands to be an admirable agent for the operation under discussion.

Mortality

During the ten-year period 1943–52 the operation of guillotine tonsillectomy and/or curettage of adenoids was performed on 12,038 children up to the age of 14 in Carlisle and the surrounding district by Mr. R. S. Venters or one of his registrars, without a single death.

The only other comparable series which has come to our notice is that of Martin (1922), embracing 14,960 cases operated on in a teaching hospital between 1907 and 1920 with six deaths. Minnitt and Gillies (1948) quote this series along with a personal communication from the author which brings the total number of cases to 23,960, and the deaths to eight. The series is not in fact strictly comparable to ours, because in a small number of cases (not stated exactly) the tonsils were dissected, and it was not wholly confined to children. Nevertheless, all eight deaths were in children undergoing the guillotine operation. In fairness we must state our belief that the contrast in the mortality between Martin's series and our own is largely due to the spectacular improvement in the health of the general population, and especially in that of the "hospital class," during the last two decades.

Summary and Conclusions

Guillotine tonsillectomy and curettage of adenoids carried out by an experienced surgeon, under ethyl chloride anaesthesia administered by a *competent anaesthetist*, is a satisfactory operation.

The procedure, as carried out by us, is described in some detail, emphasis being laid on the necessity for a considerate induction of anaesthesia.

Those who have recorded their objections to the operation base their opinions on an experience of inexpert anaesthesia, usually too light.

Contrary to widespread belief, the operation requires an anaesthesia of considerable depth.

The competent anaesthetist, who is aware of the dangers of ethyl chloride, can employ it safely.

A recent series of over 12,000 cases without a death is recorded, and contrasted with one of some 25,000 dating from the first quarter of the century, in which there were eight deaths.

We are indebted to Mr. R. S. Venters for making his records available to us and for his advice.

REFERENCES

- Aitken-Swan, J., and Paterson, R. (1955). *British Medical Journal*, 1, 623.
 Anderson, S. M. (1952). *Curr. Res. Anesth.*, 31, 262.
 Atkinson, E. C. (1942). *British Medical Journal*, 2, 620.
 Bird, H. M. (1930). *Ibid.*, 1, 147.
 Bromage, P. R. (1950). *Anaesthesia*, 5, 94.
 Burstein, C. L. (1953). *Anesthesiology*, 14, 567.
 Bush, O. F., Bittenbender, G., and Adriani, J. (1952). *Ibid.*, 13, 197.
 Capon, J. H. (1954). *Anaesthesia*, 9, 31.
 Clark, A. J. (1952). *Applied Pharmacology*, 8th ed., revised by A. Wilson and H. O. Schild. Churchill, London.
 Deming, M. van N. (1952). *Curr. Res. Anesth.*, 31, 113.
 Goodman, L., and Gilman, A. (1941). *The Pharmacological Basis of Therapeutics*. Macmillan, New York.
 Gorham, A. P. (1935). *British Medical Journal*, 2, 112.
 Hewer, C. L. (1930). *Ibid.*, 1, 262.
 Jackson, K. (1951). *Anesthesiology*, 12, 293.
 Jobson, T. B. (1942). *British Medical Journal*, 2, 512.
 Kingsford, B. (1930). *Ibid.*, 1, 262.
 Laurence, E. G. (1942). *Ibid.*, 2, 649.
 Leigh, M. D., and Belton, M. K. (1946). *Anesthesiology*, 7, 611.
 Macintosh, R. R., and Bannister, F. B. (1947). *Essentials of General Anaesthesia*, 4th ed., Blackwell, Oxford.
 McKenzie, W. (1951). *Practitioner*, 167, 622.
 Martin, G. E. (1922). *J. Laryng.*, 37, 80.
 Minnitt, R. J., and Gillies, J. (1948). *Textbook of Anaesthetics*, 7th ed. Livingstone, Edinburgh.
 Newell, R. L. (1930). *British Medical Journal*, 1, 467.
 Shaheen, H. B. (1935). *Ibid.*, 1, 37.
 Sharp, H. S. (1952). In *Diseases of the Ear, Nose, and Throat*, edited by W. G. Scott-Brown. Butterworth, London.
 Sington, H. (1930). *British Medical Journal*, 1, 217.
 Stevenson, R. S. (1952). *Recent Advances in Otolaryngology*. Churchill, London.
 Stirling, J. B. (1954). *Brit. J. Anaesth.*, 26, 411.
 Sydenham, F. W. (1935). *British Medical Journal*, 1, 179.
 Virtue, R. W., and Pierce, A. F. (1951). *Anesthesiology*, 12, 442.
 Waugh, G. E. (1909). *Lancet*, 1, 1314.
 Westell, U. M. (1941). *Ibid.*, 2, 666.