

Economics and safety of general anaesthesia in general dental practice

E. O. EVANS, M.B., B.S., D.A., M.R.C.G.P.
Stratford-upon-Avon

THIS article is based on 23 years experience in an anaesthetic service to the dentists in one town, who at the present time work in one partnership of four and three partnerships of two each. During the past three years about 3,000 general anaesthetics have been administered for dental extractions.

Techniques employed

The vast majority of cases were for simple extractions only. A few long cases where endotracheal intubation was employed have not been considered in this survey.

During the past four years or so the author has adopted a technique of induction and maintenance with nitrous oxide 75–80 per cent, oxygen 20–25 per cent plus halothane $\frac{1}{2}$ –1 per cent, increased to 2 per cent when necessary. An initial sleep dose of some intravenous agent was used occasionally.

Such a sequence is generally recognized as a safe one in experienced hands, e.g. Goldman (1968) and others. In the author's view it is particularly satisfactory in general dental practice because of the following advantages:

1. The ready avoidance of hypoxia
2. A high degree of acceptability by patients of all age groups
3. A smooth and assured induction
4. A controlled maintenance period with good relaxation of the jaw and good quiet operating conditions
5. The anaesthetic can be prolonged if necessary.

Patients have been anaesthetized sitting in the dental chair tipped backwards some 30–45 degrees. No serious complications or anxieties have occurred. The 'failure' rate has been less than 1 in 1,000. No case of laryngeal spasm, or of unconsciousness lasting more than 3–4 minutes after the administration of anaesthetic has been seen. "Fainting", as described by Bourne (1957), has been watched for but only recognized in one patient who had an intravenous induction with methohexitone, and whose mother afterwards said, "Oh! A always faints at the sight of the needle". (He recovered rapidly once placed supine). Other postoperative hypotensive syndromes have been very rare and of slight degree as assessed clinically. All have responded quickly to a change to the supine position without other measures.

In view of the great tolerance shown by patients to a non-hypoxic induction with halothane, the advantages of an intravenous induction can be exaggerated. In general dental practice, where conditions are not always ideal, there are disadvantages to introducing a second method of anaesthesia where one will suffice. It must add to the time, trouble and expense involved. Except in the case of propanidid it usually also prolongs the period of recovery.

In this series an intravenous induction was considered,

- (a) for the exceptionally nervous patient—as a form of instant premedication,
- (b) when a history of previous difficulties in dental anaesthesia was obtained, and
- (c) when it was specially requested by either patient or dentist.

Propanidid seems to have an especial value in this context, not only because of the good recovery time, but also because the hyperventilation which follows its injection assists a smooth transfer to an inhalation agent when this is required.

However, no method is without some disadvantages. The use of any adjuvant increases the time needed for recovery as compared with nitrous oxide and oxygen alone. During the recovery phase children in particular are apt to be restless. In addition the very fact that the anaesthetic is smooth, encourages the dentist to take his time over the surgical procedure; as pointed out in the Report of the Joint Subcommittee (1967), the distinction between 'long' and 'short' cases is becoming less clear. In the author's view, if the operating time is likely to exceed five minutes the patient should be intubated.

Retching and vomiting have not been eliminated. Vomiting which follows a non-hypoxic technique is due more to the presence of saliva (swallowed before the operation) or blood (swallowed after the operation) in the stomach, than to the particular agents employed. It usually occurs well after the patient has recovered consciousness and is an unpleasant nuisance rather than a danger.

A separate recovery room and nurses trained in the care of unconscious patients are often unavailable in general dental practice. With the techniques described the patient must remain much longer under the direct observation of the anaesthetist. Although the duration of surgery has rarely exceeded five minutes, the overall time per case can vary from 6 to 15 minutes. Any attempt to work more rapidly in the dentist's surgery only leads to a fall in safety standards.

Summing up, the disadvantages of the methods used are all of time and expense. They are outweighed by the greater comfort and safety of the patient and the much better working conditions accorded to the dentist.

Apparatus

To avoid unnecessary duplication the anaesthetist carries many of the drugs and apparatus with him (including fluothane, intravenous agents, laryngoscope, endotracheal tubes, syringes, intravenous infusion apparatus, additional face masks, emergency drugs, connectors etc.) This is all carried in a suitcase which is, incidentally, a good resuscitation outfit that can be useful on other occasions.

Each practice provides its own anaesthetic machine. The author's preference is for a continuous flow type, with a suitable halothane vapourizer. These are cheaper to buy, reliable, easy to maintain and economical of gases. All hospital trained anaesthetists are familiar with them. Two of the practices concerned have bought machines of this type. The other two are reluctant to do so for financial reasons and here Walton 2s are used. Neither of these machines is really safe until the administrator is fully familiar with their idiosyncrasies.

Safety in anaesthesia

1. Skill in the administrator

Clearly this is the most important single factor. The report of the Joint Subcommittee on Dental Anaesthesia (1967) states that "ideally all general dental anaesthetics should be administered by specialist anaesthetists trained in dental anaesthesia". Coplans (1968) examined this suggestion in detail and concluded that it was not necessarily impractical. But the availability of training is not alone sufficient. First there must be some incentive to doctors and dentists who are interested in this work to undergo the

training. Secondly, the rewards must be such as to encourage the trained anaesthetists to devote a sufficiently large part of their professional working time to the actual practice of dental anaesthesia. The joint subcommittee acknowledged that economic factors come into this problem, but that is an understatement. The truth is surely that they are at the root of it.

Methods of payment will be considered later, but with a basic fee of 15/-d. (75p.) per case, from which expenses must be met, there is not going to be any rush of applicants for training. Indeed, if any authority is in earnest about trying to raise standards of dental anaesthesia, not only must the basic fee be adequate, but also the proper training must be appropriately recognized.

2. *Facilities and apparatus*

Notwithstanding the importance of skill in the anaesthetist, good facilities and apparatus are a material factor in the safety of anaesthesia. There is no reason why the patient who goes to a dentist in general practice should be deprived of the facilities available to hospital and clinic patients. There are still dental chairs in use which will not come to a horizontal position and surgeries without suction apparatus or reliable anaesthetic machines. Some practices have inadequate recovery room facilities and few have nurses trained in the care of the unconscious patient.

Exhortation in these matters is not sufficient. The dentists who do not do a large number of extractions each year under general anaesthesia can never, for example, even recoup the cost of a new anaesthetic machine. A method must be found to encourage high standards of equipment. It will always be medically indefensible for any dentist to operate without ready access to oxygen under pressure for his patients; it should also be financially inexcusable.

3. *The dentist-patient relationship*

Fortunately in this regard the dentist in general practice has advantages over his hospital colleagues. Many of his patients are well known to him by the time they come for extractions under anaesthesia. Appointments are well kept and none of the patients in this series was kept waiting more than a few minutes. In Goldman's words "The walk to the dental chair and the sight of the equipment may be sufficient to produce a faint". I have never seen a pre-anaesthetic faint in general practice. On the other hand, I have seen children enter the room, adjust the chair to their own liking and even strap themselves in. If a patient feels he is among friends, is confident, and has not been kept waiting it adds much to the safety of his anaesthetic.

Financial considerations

The payment for all services in general dental practice, including general anaesthesia is done on a fee per item of service basis. The fee is intended to cover all the necessary expenses involved. The first step, therefore, in assessing the fairness of the fee is to consider the expenses involved. The table illustrates the actual expenses in the four practices served by the author, using the methods described.

Discussion

Some of the results require explanations, thus:

1. The difference in the number of extractions per dentist/year is striking. However, the writer's impression is that this is due more to the different social classes dealt with than to any particular views about extractions under general anaesthesia.
2. The use of halothane in each practice was not separately recorded. The overall average figure of almost 1/- (5p.) per case is similar to that reported by Ball and Allen

(1969), but it will be appreciated that the actual figures must be greater in those cases where the cost of gases is higher.

3. When allowance is made for cost of cylinder hire the cost of gases is also similar

ANAESTHETIC COSTS IN FOUR GENERAL DENTAL PRACTICES

	Machine used	Vapourizer	No. of cases investigated	Period of investigation	Cases per practice per year	Cases per dentist per year	Cost of gases plus cylinder rental per case	Annual maintenance charge of anaesthetic machine	Cost of halothane per case
* (1) Practice 1 4 partners	Walton "2"	Goldman	182	12 mths	182	45.5	1/10½d.	£7 3 Od. = 9½d. per case	Overall average in the 4 practices = 1/0½d. per case
Practice 2 2 partners	Salisbury M.I.E.	Fluotec	1664	27 mths	473	236.5	-/9.1d.	£5 8 6d. = 2½d. per case	
Practice 3 2 partners	Salisbury M.I.E.	Fluotec	92	6 mths	184	92	†(2) 1/7½d.	£4 12 6d. (min). = -6d. per case	
Practice 4 1 partner & 1 assistant part of the time	Walton "2"	Goldman	203	12 mths	203	150 approx.	2/10½d.	£7 13 Od. = 9d per case	

NOTES:

* (1) Half the cases in this practice were administered by another anaesthetist.

† (2) This figure is erring on the high side because the anaesthetic machine was purchased at the beginning of this period and a larger rental figure than normal is included.

ADDITIONAL COSTS INCLUDE:

1. The capital cost of the anaesthetic machine.
2. The capital cost of the anaesthetist's equipment.
3. Methohexitone (at 1/-d per case). Propanidid (at 2/3d per case) when used.

to that reported by Ball and Allen. Costs were rather lower in Practice 1 than Practice 4 because the Walton "2" had been modified to take larger cylinders.

4. The figures illustrate how the cost per case is reduced by the use of a modern machine of the continuous flow type, and in practices where larger numbers are dealt with in a given time.

5. The cost per case, to be meaningful, must include those other items which are concerned exclusively with general anaesthesia. Of these the capital cost of the anaesthetic machine is a substantial one. The Salisbury and the Mini-Boyle both cost in the region of £200 with vapourizer. If this sum is written off over ten years, it would add about 1/- (5p.) per case to Practice 2, and about 2/- (10p.) per case to the other three practices.

Summing up, the lowest average cost per case was in the practice where a large number of cases were dealt with each year and where a modern continuous flow type anaesthetic machine was used. This was approximately 3/- (15p.) per case when no intravenous induction was used. However, in the other three practices, despite there being about 200 cases per year the average costs ranged between 5/- (25p.) and 7/- (35p.) per case.

Methods of remuneration

Despite the fact that the national health patient is receiving National Health Service treatment in general dental practice, the anaesthetist is acting in a 'private' capacity and is paid by the dentist. To meet this the dentist receives a National Health Service fee of 15/- (75p.) per case for the majority of cases where 1-3 teeth are extracted. The fee is raised (up to a maximum of £2 2s. (£2.10p.) for a complete exodontia. It is the usual practice in Stratford-upon-Avon for the dentist to pay the anaesthetist the National Health Service fee less ten per cent to cover part of his expenses.

The system has many anomalies, thus:

1. It is clear from the above account of the actual expenses involved that the dentists

are having to subsidize general anaesthesia out of their other earnings.

2. The National Health Service fee takes no account of the skill or experience of the administrator. It has not been adjusted to take account of the greater expense of modern drugs such as halothane and propanidid, nor of the longer time involved when safer modern techniques are employed.

3. On the other hand the fee is loaded too much in favour of multiple extractions. There is no great difference in either the time, the skills or the expenses involved in anaesthesia for the removal of three teeth compared with those for a complete exodontia. Moreover, the loading encourages bad work—for example if a patient's multiple extractions are dealt with in two separate sessions, which is often desirable on medical grounds, the anaesthetic fee is still assessed as if they were all extracted at one sitting.

4. Because the anaesthetist is acting in a 'private' capacity, the dentist gets the superannuation benefits of the anaesthetic fee. This is not a significant disadvantage to the anaesthetist who only works in the dentist's surgery occasionally. However, it becomes significant to anyone who spends much of his time in this work. It is therefore an important consideration if general dental anaesthesia is ever to be concentrated into the hands of a relatively small number of experienced anaesthetists as recommended by the joint subcommittee.

Apart from the actual method of payment, the amount of the current fee must be considered. Thanks to the rising standards of dental hygiene, the number of multiple extractions required is steadily decreasing. Approximately three quarters of the cases considered here were for the extraction of 1-3 teeth where the fee paid to the dentist for the anaesthetic was 15/- (75p.). For a professional service requiring high skills, considerable experience and concentrated vigilance, such a fee would be derisory even if the dentist was able to pay the whole of it to the anaesthetist.

In short, the present system actively discourages the dentist from doing work under general anaesthesia or from equipping his surgery adequately for this purpose. It also gives no incentive to the inexperienced anaesthetist to seek further training, and provides no attraction to the experienced anaesthetist. The patients deserve better than this. We shall be guilty as a profession if we do not press for appropriate reforms.

Practical proposals

The first essential of any new system is that it should ensure that the dentist is fully reimbursed for all the costs of providing the necessary equipment for safe general anaesthesia.

The second essential is that the fee paid to the anaesthetist should be sufficient to attract competent trained anaesthetists to this work, and include an element of superannuation so that there is no disincentive on trained anaesthetists to spend a fair proportion of their working time in dental work.

In assessing the fee due regard must be paid to the nature of general dental practice. Thus it is frequently impossible to collect large lists of patients together—sometimes only one or two patients can be done in one session. The provision of separate recovery rooms with nurses trained in the care of the unconscious patient are often impractical or uneconomic. Group dental practice may be a long-term solution to this problem, but in the meanwhile, general anaesthesia in general dental practice cannot be a hurried production-line affair without loss of safety standards. It also takes time for the anaesthetist to travel to the dentist's rooms and to check the apparatus—and this must be allowed for; on the other hand, the time and skill involved in anaesthesia bears little relation to the number of teeth extracted, and in the interests of simplicity this need not be taken into account.

It is difficult to see how these necessary improvements can be effected until anaesthetists are paid direct by the executive councils, as already recommended by the General Medical Services Committee. The executive council could then be asked to be responsible, with appropriate expert advice, for maintaining a 'dental anaesthetic list' of doctors and dentists who had had adequate training and experience in general anaesthesia for dentistry. It is suggested that those on 'the list' would be entitled to a higher fee for their services. This method has been tried in midwifery in general medical practice and it has led to considerable improvement in vocational training in that sphere. There is every reason to suppose that it would have equally beneficial effects on standards of general anaesthesia in dental practice.

*Proposed scale of fees**

If the anaesthetist is paid directly by the executive council, some other method must be found for reimbursing the dentist for the expenses involved in the provision of facilities and equipment which are required solely for the purposes of general anaesthesia. For example:

The dentist's payments:

1. For the provision of an anaesthetic machine:
An initial 15 per cent of the cost of the machine plus 15 per cent annually on its current written down value.
2. To cover the cost of gases, the rental of cylinders and the maintenance of the anaesthetic machine (say) 3/6d. (17.5p.) per case.

The anaesthetist's payments:

1. A visiting fee..... 21/- (£1.05p.).
(This to be payable only once for any one session, and only when in fact the anaesthetist is not working in the same building).
2. The anaesthetist's expenses..... 2/6d. (12½p.).
3. An administration fee per case:
 - (a) Anaesthetists on the "Dental Anaesthetic List"..... 25/- (£1.25p.).
 - (b) Other anaesthetists..... 17/6d. (87½p.).

In the author's view these are the minimum and the most urgent reforms needed to ensure a rising standard of skill, and safety for the patient, in general anaesthesia in general dental practice.

Summary and conclusions

1. An anaesthetic service to four general dental practices is described, including the methods, drugs and apparatus currently employed.
2. The expenses involved in the provision of general anaesthetic facilities in each practice are listed and discussed.
3. The following conclusions are reached:
 - (a) That there is an important economic factor in the safety of general anaesthesia in that modern techniques take longer and are more expensive.
 - (b) That dentists are at present having to subsidize general anaesthesia in general practice out of other earnings.
 - (c) That the present system of payment is a disincentive on the dentist to improve his facilities and apparatus for general anaesthesia and gives no encouragement to the employment of skilled and experienced anaesthetists.
4. Practical proposals are put forward, the main features of which are:
 - (a) The payment of anaesthetists direct by the executive councils.

*Related to 1969 rates of remuneration.

- (b) The establishment (by the executive councils, with appropriate expert advice) of a 'dental anaesthetic list'.
- (c) Recognition of experience in dental anaesthesia by pay differentials.

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IMMOBILIZING THE LIMB

The surgeon when he wishes to make any part or bandage particularly secure, has it in his power to convert his rollers into a firm case, either by soaking the bandages in whites of eggs, which soon hardens in a very hard varnish; or with the whites of eggs may be mixed a little white flour and sugar to make it into a paste, or he may apply any common varnish over the bandages, as white spirit varnish, but that is slow of fixing, and is very thin, or he may strew a little powdered rosin on his bandages before they are applied, and then by soaking the bandages in spirits of wine, the rosin is dissolved, and the whole adheres to the limb with very singular firmness; or finally, the bandages may be soaked with fine and well made glue, which makes a very firm case, and is very far from being offensive.

These methods are all of them more cleanly, less cumbersome, and indeed I think more effectual than the old Arabian method of bedding a fractured limb in stucco or Paris plaster.

John Bell, *The principles of surgery* (1801), Vol. 1, p. 640.