PREMEDICATION; PHYSIOLOGICAL AND OTHER CONSIDERATIONS

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In speaking first of the advantages of sedative premedication or basal narcosis, I need say little of the benefits which these procedures confer upon the patient. This is a matter regarding which your experience has left you without any possible doubt.

Some time ago I was surprised, and not a little amused, to receive from a lady who had recently undergone an abdominal operation a lengthy and highly creditable description, in writing, of the advantages of basal narcosis from the patient's point of view. This lady had some years previously undergone another operation. She described graphically her feelings on this occasion, as she walked from her bedroom to the theatre, as she saw for the first time the forbidding surroundings of the place where surgery is practised, and as she stepped with what show of courage she could muster on to the operating table, where she went to sleep after what appeared to be an interminable experience of nightmare unpleasantness, to the accompaniment

* An address delivered to the Scottish Association of Anaesthetists.
all the while of animated conversation between the surgeon and his assistant and of a variety of terrifying sounds of ever-increasing intensity. In due course, returning consciousness brought with it a recurrence of the previous fears—fears which were with difficulty banished even when rational control was again established. An unpleasant picture certainly, but a picture in no way overdrawn, of what anaesthesia can mean. This lady described how, on the next occasion, some years later, she went quietly to sleep, and was, without any awareness of the fact on her part, anaesthetized in her own bedroom. Returning consciousness brought with it only a pleasantly dreamy state, devoid of all anxiety and undisturbed even by pain. The nurse’s assurance that the operation was over some hours before seemed almost too good to be believed.

Such stories you have all heard from your patients. Hence I wish to say nothing more about a matter so obvious as is the advantage of premedication from the patient’s point of view. I do, however, want to speak of certain other advantages, and to show, if I can, that these advantages can be claimed as such, on sound physiological grounds—on physiological grounds so sound indeed that premedication would appear to become a necessary duty for the anaesthetist, instead of remaining merely a useful addition to his procedure.

One of the chief benefits of premedication is the manner in which it enables us to exploit to the full the advantages of the modern methods of anaesthesia, by which I mean particularly those methods which enable us to be largely independent of agents which depend in the production of anaesthesia on their toxic action on the cells of the central nervous system. All anaesthesia is produced by a temporary reduction of the intra-cellular oxygen content. The volatile anaesthetics—ether and chloroform—secure this effect by a process of cell-poisoning so complete that normal oxygen maintenance becomes impossible. More or less prolonged toxic interference with cell function is the result. Nitrous oxide has the purely physical and entirely non-toxic action of oxygen replacement by diffusion of gases, and is harmless so long as the replacement process is not carried to
extremes. Nitrous oxide therefore is much less detrimental to the patient than is the volatile anaesthetic which obliges him to deal with a toxic factor at a time when the operation itself makes a considerable demand upon his resources.

I think, however, that no one will nowadays claim to be able adequately to anaesthetize with gas-oxygen alone the unpremedicated abdominal case, where muscular relaxation must be provided. Adequate premedication does, however, enable the patient to enjoy the benefits of gas-oxygen anaesthesia and obviates the possibility that so-called gas-oxygen anaesthesia will degenerate into a method of closed ether administration—a state of affairs which has been by no means uncommon in recent years and which, I think, is often more harmful to our patients than is an open ether anaesthesia efficiently administered. We know that when we use gas and oxygen, two things are of vital importance. Firstly, since the nitrous oxide percentage must be high in order to secure surgical anaesthesia, it is essential that the oxygen content of the mixture should be the minimum which is compatible with adequate oxygenation; and secondly, this minimum oxygen requirement must be respected; no sacrifice must be asked of it in order that the nitrous oxide may gain thereby, for in this way a detrimental effect may be introduced which largely nullifies for the patient the advantages of nitrous oxide oxygen anaesthesia. Obviously, if we can do something to lower temporarily the oxygen requirement of the patient whom we propose to anaesthetize with nitrous oxide and oxygen, we can use a higher percentage of nitrous oxide with safety and can therefore secure a much more satisfactory anaesthesia—and it is to be remembered that a reduction of 1 per cent or 2 per cent in this oxygen requirement, with the resulting possibility of using an additional 1 per cent or 2 per cent of nitrous oxide, may make all the difference in the world between good and indifferent anaesthesia. Fortunately, this highly desirable state of affairs is attainable with the help of suitable premedication. It is reasonable, I think, to assume that the vast majority of our unpremedicated patients come to the operating theatre with an emotional disturbance ranging from a state of mild nervousness
or anxiety to a condition of acute apprehensiveness or actual fear. Now an emotional disturbance of any sort, and particularly an emotional disturbance of this nature, is a thing which, more almost than anything else, causes a rise in the rate of basal metabolism. A raised metabolic rate means inevitably a rise in oxygen demand, and we can therefore logically argue that our patients come to the theatre in a condition anything but ideal for the administration of any anaesthetic but particularly of an anaesthetic which, like nitrous oxide, demands for success that oxygen requirement should be at a minimum. When adequate premedication has been given, the factor of emotional disturbance is entirely eliminated, metabolic rate instead of being enhanced is lowered, and gas-oxygen anaesthesia is rendered an entirely different proposition. On physiological grounds, therefore, premedication or basal narcosis is justified by reason of the manner in which, by control of metabolism, it assists the anaesthetist in his task. This statement is true of any kind of anaesthetic, but overwhelmingly so in the case of nitrous oxide where relative gas-oxygen percentages mean so much, and where otherwise the full benefits of this type of anaesthesia may not be available for the patient.

I would summarize the position with regard to gas-oxygen anaesthesia by saying, firstly, that there are occasions when a true gas-oxygen anaesthesia will be the determining factor in the post-operative survival of the patient—particularly where that patient is debilitated or toxic and the operation is protracted; secondly, that true gas-oxygen anaesthesia is anaesthesia with gas and oxygen and not anaesthesia with gas, oxygen and ether; thirdly, that if any other interpretation of gas-oxygen anaesthesia is accepted which results in the use of considerable quantities of ether, or which tolerates more or less sub-oxygenation, then the choice of anaesthetic confers no benefit whatever upon the patient; and lastly, that the administration of true gas-oxygen anaesthesia should only be undertaken, and can only be undertaken successfully (in abdominal surgery at all events) when adequate and suitable premedication has been given. Nitrous oxide is the safest of all anaesthetics—
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this is true only when its limitations are countered by suitable preparation of the patient, and not by the questionable methods sometimes employed during anaesthesia itself.

While basal narcosis can be said to be almost a necessary preliminary to gas-oxygen anaesthesia, its use, though not so essential, is undeniably helpful to the anaesthetist before ether anaesthesia. It is a matter of common observation that after adequate premedication the patient requires considerably less anaesthetic. It is not exaggerating to say that in many cases one half the usual amount suffices—and this in spite of the quiet breathing which is often present. This lessening of the amount of anaesthetic required is, of course, again the result of the lowered metabolic rate. When in any discussion of premedication you point to the benefit secured for the patient by this reduction of anaesthetic, you may be told that this is just what you would expect, in view of the fact that the patient is so thoroughly “doped” before the anaesthetic is begun. This is true only up to a point. The reduction in anaesthetic requirement bears no proportion to the extent to which the patient has been previously “doped”. Quite conservative premedication is sufficient to secure marked reduction in the amount of anaesthetic required. The essential factor is the controlling effect on basal metabolism.

Incidentally, “basal narcosis” as a descriptive term is not altogether satisfactory. It suggests the provision of a certain degree of preliminary narcosis, which is merely completed to the point of surgical anaesthesia by the subsequent anaesthetic. Actually, I think, it fails to indicate that the really important factor is not the narcosis in itself, but the temporarily lowered metabolic rate with which this narcosis is associated.

Suitable premedication, then, by eliminating pre-operative emotional upset, maintains at a normal level, or renders sub-normal, the metabolic rate. In this way anaesthetic requirement of any anaesthetic is lessened, and oxygen requirement is also lessened, providing the anaesthetist with just what he desires most, when gas-oxygen is the anaesthetic he proposes to use. But the elimination of emotional upset does more than this.
Pre-operative emotional disturbance, whether it be merely the natural nervousness of the surgical patient, or as it not infrequently is, a condition not far removed from actual terror, has the effect which emotional disturbance always had, of producing a temporary hyper-activity of the supra-renal glands with resultant excess of adrenaline in the circulation. Further, supra-renal hyper-activity is one of the factors on which the occurrence of ventricular fibrillation depends. Ventricular fibrillation causes immediate general circulatory cessation, including a cessation of coronary circulation, with consequent deprivation of the heart itself of oxygen—a state of affairs which can only result in death after a short interval unless the fibrillation of the ventricles is exceedingly transitory. There has been a tendency to associate ventricular fibrillation entirely with chloroform anaesthesia. There is, of course, no doubt that ventricular fibrillation occurs most frequently in chloroform anaesthesia. It may, however, occur during anaesthesia with any agent. I think, indeed, it probably occurs in transitory form and passes unobserved, more often than is generally suspected. I myself, in some seventeen years of anaesthetic work, have noted transitory ventricular fibrillation, recognizable as such, on four occasions with anaesthetics other than chloroform. Its occurrence is dependent on a combination of factors—namely, the predisposing factor of adrenal hyper-activity induced by emotional disturbance, together with a precipitating factor, in the nature of a surgical or other stimulus which occurs during the induction period. Basal narcosis entirely eliminates the predisposing factor of emotional upset, and thereby renders the possibility of ventricular fibrillation more remote.

When we speak of the benefits of basal narcosis we must not forget to consider whether the surgeon shares in these benefits. There is, I think, no doubt that he does. One thing is certain; the immediate post-operative comfort of his patient is a good foundation for a satisfactory convalescence. His actual operative work too, especially if it be abdominal in nature, is aided greatly by the characteristic action of basal narcosis upon respiratory activity. The typically quiet, sometimes almost imperceptible, breathing
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provides a state of affairs surely infinitely happier for the surgeon, than does the exaggerated breathing of open-ether anaesthesia, which is far from ideal for abdominal surgery. Even in relatively deep ether anaesthesia, with considerable muscular relaxation, exaggerated activity of the diaphragm may render things by no means easy. In normal breathing, apart from anaesthesia, the work done by the diaphragm is relatively small as compared to the work done by the intercostal muscles. In progressively deepening anaesthesia, the diaphragm progressively undertakes a larger share of the work; intercostal activity becomes correspondingly less, until ultimately, when the stage of deep surgical anaesthesia is reached—the so-called third stage—complete paralysis of the intercostal muscles takes place, the thorax is completely immobile, and diaphragmatic activity is at a maximum. Now this is the stage at which many abdominal operations are carried out; this depth of anaesthesia is necessary if muscular relaxation is to be adequate, and yet it is accompanied by an activity on the part of the diaphragm which may seriously inconvenience the surgeon who is endeavouring to close an upper-abdominal incision, and who may be inclined to attribute his difficulty to an insufficiency of just that muscular relaxation which his anaesthetist has been at such great pains to provide. This problem of intercostal paralysis with diaphragmatic hyperactivity is unlikely to become acute in the premedicated, quietly breathing patient; a fact which constitutes, to my mind, one of the major indications for adequate premedication in all abdominal surgery.

Incidentally, it is a matter for surprise that the modification which occurs during anaesthesia in the ratio of work done by thorax and diaphragm remained for so long uncommented upon by anaesthetists. You can observe this phenomenon in any case where you have occasion to produce deep anaesthesia.

While the advantages of premedication and basal narcosis to patient, anaesthetist and surgeon can scarcely be doubted, the question of disadvantages, theoretical and actual, is a matter lending itself to some controversy. The possibility of controversy is indicated by the fact that while
one anaesthetist in a recent text-book includes amongst the advantages of basal narcosis its effect in reducing post-operative pulmonary complications, there appeared some time ago a book, which most of you have probably read, in which the author endeavours to show, from statistics, that the use of basal narcotics has definitely increased the tendency to pulmonary and other complications after operation. Whatever you may think of the value of statistics in general, or of these statistics in particular, the book is of value in that it shows that to some people the wisdom of basal narcosis is questionable on the grounds that it may be responsible for certain post-operative complications. The question thus raised must certainly be answered if we are to use basal narcosis with equanimity, and an answer is best sought for in a consideration of the physiological principles concerned. May I say, incidentally, that from my own experience of premedication and basal narcosis, I am so completely convinced that it need never be responsible for complications, that I can only find in statistics which appear to show the contrary, proof that the grossly injudicious use of basal narcotics is commoner than it ought to be.

The factor introduced into anaesthesia by basal narcosis which raises the question of possible post-operative pulmonary pathology, is the factor of respiratory depression. This, of course, is a characteristic result of basal narcosis, and indicates the elevation of the respiratory centre's threshold for carbon dioxide stimulation. It may be argued that the lowering of respiratory activity after basal narcosis (and it is indeed lowered at times to a point where breathing is little more than just perceptible) subjects our patients to a greatly increased risk of bronchial or pulmonary post-operative trouble ranging in seriousness from merely "a bit of a cough" to an actual pneumonia or a condition of multiple areas of pulmonary collapse. But it must be borne in mind that quiet breathing in itself does not constitute a danger. Respiratory activity is reduced during physiological sleep. When we sleep for eight hours we do not awake apprehensive lest our good night's sleep should have unfortunate consequences. Admittedly, if we are fortunate
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enough to sleep for eight hours while we are the victims of bronchitis we are likely enough to have to indulge in a good deal of strenuous coughing on awaking—a proceeding which we have no difficulty in imagining as distinctly unpleasant were we unfortunate enough to be possessed at the same time of an abdominal wound. The depressed respiratory activity of basal narcosis is a potential danger only when it is associated with considerably increased secretory activity in the respiratory tract. But this is a thing which need not be assumed to be an inevitable accompaniment of anaesthesia—whether it be nitrous oxide or ether or any other sort of anaesthesia. We must, of course, at times anaesthetize patients who are the subjects of some chronic pathological bronchial or pulmonary condition, but for the most part our patients are normal when they come to us as far as the respiratory tract is concerned, and it is our business to keep them so throughout anaesthesia. Excessive secretion during anaesthesia can be avoided almost always by pre-operative care, by smooth induction and maintenance of anaesthesia, and, most important of all, by preservation of a completely perfect airway throughout the period of unconsciousness. I know of nothing in the whole business of anaesthesia which can equal in importance the maintenance of an airway which in no respect falls short of that present in the unanaesthetized subject, and I think that it is just in this matter that the casual or occasional anaesthetist most often fails. It is a matter which, always of paramount importance, has become increasingly so in these days of basal narcosis, involving, as it does, a respiratory depression which is, from the point of view of subsequent respiratory complications, in itself harmless, but which, in conjunction with uncontrolled secretory activity, is fraught with a not inconceivable risk.

Speaking generally, I think that those of us who are most enthusiastic about basal narcosis would be the first to admit that its injudicious use can be definitely harmful—can indeed lend itself to the production of statistics which give cause for alarm. The use of basal narcosis in a manner which ignores the physiological principles underlying
respiratory activity and control must inevitably lead to trouble. An accurate knowledge of these physiological principles has always been a necessity for the anaesthetist who wishes to do his work intelligently and safely. It was never more so than it is to-day, when the general use of premedication and basal narcosis demands in addition a clear understanding of the effects which these things have upon respiration. Normal physiological respiration is modified by anaesthesia preceded by basal narcosis. It is necessary to know the nature and effects of these modifications.

Normal respiratory activity depends upon two main factors. First of these is the respiratory centre, the most obvious characteristic of which is the rhythmic manner in which it functions. This rhythm is due partly to rhythmic reception of afferent impulses produced elsewhere, and is partly an inherent characteristic of the centre, since rhythm is not totally abolished by cutting the nerves by which afferent impulses may be transmitted. If, however, section of these nerves is performed in an animal which has been deeply anaesthetized, respiration may immediately cease. This suggests that in anaesthesia the depression of the cells of the respiratory centre produced by the anaesthetic has temporarily destroyed the inherent rhythmic or automatic quality of the centre and has left it dependent for continued functioning upon afferent nerve impulses. Carbon dioxide is, of course, responsible for the chemical control of the respiratory centre. An increase of carbon-dioxide tension in the blood results in an increase in the acidity of the cells of the respiratory centre. This increased acidity produces an increased activity on the part of these cells, which results in the generation of more powerful efferent impulses; hence the increase in respiratory depth.

The second main factor in respiratory control is the reflex mechanism which has its starting point in the lungs themselves. From end-organs in the lungs afferent impulses pass to the respiratory centre. These end-organs are stimulated specifically in a two-fold manner, one group by distension of the lung and another group by absence of distension. The absence of distension at the end of expiration sets up impulses which produce inspiration; after inspira-
Premedication has proceeded so far, distension of lung activates impulses by which further inspiration is inhibited.

We want to see how anaesthesia and particularly anaesthesia following basal narcosis modifies the influence of these two main factors in the control of respiration. Modification of the chemical factor in control is associated with the fact that the respiratory centre is progressively depressed as anaesthesia is progressively deepened. By this is meant that the threshold at which activation of afferent impulses takes place is raised, with the result that a given carbon-dioxide tension has a progressively diminishing effect in stimulation. Modification of the other factor—that of afferent impulses set up in the lung—is dependent on the circumstances of anæsthetization and on the anaesthetic in use. In gas-oxygen anaesthesia we employ a non-irritating gas which, by virtue of the absence of irritation, produces no abnormal stimulation of the end-organs in the lungs and therefore no increase in reflex activity. On the other hand, we employ partial rebreathing with consequent enhanced carbon-dioxide tension, and the result is that depression of the respiratory centre does not produce unduly depressed respiration. In chloroform anaesthesia we are using a volatile but non-irritating agent. Carbon-dioxide retention is absent owing to the open method employed, and lung reflexes are not stimulated by the anaesthetic. The result is the quiet and depressed breathing characteristic of chloroform anaesthesia. In ether anaesthesia we are employing an agent which is an irritant to lung tissue and which therefore stimulates powerfully the end-organs of the afferent nerve fibres, whereby the depth of respiration is maintained in spite of the facts that the centre is progressively depressed by the anaesthetic and that the open method of anaesthesia does nothing towards the maintenance of carbon-dioxide tension. The well-known safety of ether is probably largely due to the fact that its stimulating effect on the reflex mechanism in respiratory control renders its modifying effect upon the chemical control of less consequence. In cyclopropane anaesthesia we use a non-irritating gas, which consequently does nothing towards reflex stimulation. In addition, we employ carbon-dioxide absorption
thereby allowing the centre’s threshold to rise without any simultaneous rise in carbon-dioxide tension. The result, of course, is the quiet breathing characteristic of cyclopropane, the similarity of which, clinically, to chloroform has frequently been commented upon.

The physiology of respiration is still further modified when basal narcosis has been employed prior to anaesthesia. Before anaesthesia is begun the respiratory centre is already depressed; its stimulation threshold for carbon dioxide is already raised; the anaesthetic produces still further depression; there is no additional factor present to set up a compensating activity in the reflexes generated in the lungs. Hence the markedly depressed respiration observed after basal narcosis—the respiratory depression which has been responsible for misgivings in certain quarters regarding the possible increased risk of post-operative respiratory complications. I think that long acquaintance with the well-maintained respiratory volume of ether anaesthesia has made it difficult for some anaesthetists to accept without misgiving the very quiet breathing associated with most forms of basal narcosis. Yet in neither case is any pathological factor introduced. There is certainly nothing pathological in quiet breathing due to temporary raising of the respiratory centre’s stimulation threshold, any more than there is in exaggerated breathing due to hyper-stimulation of afferent nerve endings. Both merely imply modification of normal physiological processes.

Unless, however, we are careful, basal narcosis may lend itself to the appearance of a condition which is distinctly pathological, and, as such, highly detrimental. I refer to anoxæmia. Anoxæmia is a condition which may occur, apart from anaesthesia, in pathological circumstances which involve diminution of air-intake with consequent lowering of alveolar oxygen tension; it may occur in the course of any anaesthesia, particularly when an imperfect air-way is allowed to persist; it may occur especially in anaesthesia which has been preceded by basal narcosis, and which is therefore associated with diminished respiratory activity. If, under such circumstances, some degree of imperfection of the air-way is present, the occurrence of
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anoxæmia is by no means unlikely. Anoxæmia may develop insidiously. It is not necessarily accompanied by cyanosis; in anæmic patients it is unlikely that it will be so. It is not inevitably associated in its earlier stage with the extreme respiratory depression to which it later gives rise. On the contrary, a considerable degree of anoxæmia may exist in the presence of respiration which is well maintained. The reason for this is interesting, and depends on a mechanism by which provision has been made for respiratory stimulation, under certain emergency circumstances, which would otherwise have an immediately detrimental effect on respiratory activity. Situated behind the carotid sinus at the bi-furcation of the common carotid artery is the carotid body, a small mass of highly specialized tissue, the characteristic of which has been proved to be a sensitivity to certain types of physiological abnormality, and the function of which is, when thus sensitized, to transmit afferent impulses to the respiratory centre whereby respiration is stimulated. The carotid body behaves in much the same way as do the end-organs in the lungs, but with this difference, that its action is reserved for certain circumstances which are not present under normal physiological conditions. One of these circumstances of altered physiology is anoxæmia. Therefore the patient who is anoxæmic may be breathing well until such time as increasing anoxia renders the centre unresponsive to the carotid body reflex and respiration fails. If the anaesthetist, suspecting anoxæmia, administers oxygen, he may have the rather disconcerting experience of finding that the administration is immediately followed by a marked reduction or by a complete cessation of respiratory activity. He has removed the anoxæmia; he has removed the source of reflex respiratory stimulation; depression or cessation of respiration is, and must be, the result. Better, however, is a temporarily apnoic patient whose blood is adequately oxygenated than one who is breathing but who is becoming progressively more anoxæmic and who is therefore becoming increasingly the victim of the serious consequences of tissue anoxia, which is the inevitable result of continued anoxæmia.

It may be argued that if modern methods of premedica-
tion give rise, by reason of their depressant effect on respiration, to questions of anoxic risk, and risk of postoperative pulmonary pathology, and other risks real or imaginary, that such questions may be adequately answered by the no less modern use of carbon dioxide. It may be said that since we never give an anaesthetic nowadays without having carbon dioxide at hand, there is no need to have any anxiety in the matter of respiratory depression. But I am convinced that carbon dioxide, invaluable as it is to the anaesthetist, is often indiscriminately used, without regard to physiological principles. The patient adequately premedicated with a view to obtaining all the advantages which premedication can confer upon him and his anaesthetist, is likely to exhibit a lessened respiratory activity during the induction of anaesthesia, during the maintenance of anaesthesia, and during the immediate post-anæsthetic period. The diminished respiration during induction is due to the raising of the respiratory centre's threshold by the drug or drugs employed. During the period of surgical anaesthesia the threshold is still further raised by the action of the anaesthetic, and during this period the response to carbon dioxide is, by comparison with the unpremedicated patient, lessened and delayed. This is a significant fact which suggests that in order that the centre's elevated threshold be reached, higher concentration of carbon dioxide than usual must be employed—and this in spite of the fact that by reason of the state of quiet respiration existing the patient's own alveolar carbon-dioxide tension may be higher than normal. The question arises as to whether one is justified in the free use of carbon dioxide at a time when the patient's carbon dioxide may already be high, in an attempt to stimulate a respiratory centre whose threshold for stimulation has been so greatly elevated. I think that under such circumstances there exists a danger of carbon-dioxide overdose—a possibility which must be borne in mind, as its consequences may be serious. After all, carbon dioxide in excess is toxic, and ultimately exerts a narcotic and paralytic effect upon the respiratory centre. During the induction of anaesthesia matters are somewhat different, in so far as depression of the respiratory centre by the anæs-
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thetic has not, at that stage, proceeded far. Some carbon
dioxide may therefore be legitimately employed to facilitate
induction. Post-operatively, too, carbon dioxide may be
judiciously used, since by that time the depressant effect
of the anaesthetic has been withdrawn, and the response to
reasonably small quantities of carbon dioxide is enhanced,
and since moderate stimulation of breathing will accelerate
elimination of the anaesthetic.

My own conclusions regarding the use of carbon dioxide
in cases where basal narcosis has been employed are that
while it is permissible and helpful and beneficial during
induction and recovery, it should be employed during the
maintenance period of anaesthesia with circumspection and
with full consideration for physiological principles. Under
ordinary circumstances, it is rarely necessary and may be
actually harmful; its use is frequently an indication of
failure on the part of the anaesthetist to remain comfortable
in the presence of respiratory depression. During anaes-
thesia which is unusually prolonged, brief periods of
moderate stimulation from time to time, avoiding always
any considerable concentration of carbon dioxide, are per-
missible and may be advantageous to the patient, particu-
larly where the presence of mucus secretion in the air
passages is suspected.

Regarding the actual drugs used for purposes of pre-
medication and basal narcosis I need say little—what I do
say represents some of my own ideas on the subject. Per-
haps I may be permitted first to say a word about the place
of atropine in premedication. Atropine is a metabolic
stimulant; as such it is just the type of drug one would
prefer to avoid before anaesthesia. On the other hand, its
action in inhibiting secretions is so intensely valuable, par-
ticularly in children, that we frequently overlook its short-
comings. Before gas-oxygen anaesthesia, however, where
anything which tends to increase metabolism and thus the
patient's oxygen requirements must at all costs be avoided,
atropine, as a metabolic stimulant, is contra-indicated. The
place of atropine can frequently be taken with advantage
by scopolamine. Scopolamine is no less effective than atro-
pine in inhibiting secretory activity, and it possesses in
addition the advantages of being sedative and of producing amnesia. Hyoscine is often employed, but is unsatisfactory, in that it not infrequently produces excitement. The relationship of hyoscine and scopolamine is sometimes misunderstood. Hyoscine contains two alkaloids, a dextro-rotary and a laevo-rotary; the action of the former, which is a stimulant may predominate; the action of the latter is sedative, and it is this sedative laevo-rotary alkaloid alone which should be used, and which is present in the excellent omnopon-scopolamine combination supplied in ampoule form by Roche.

This combination provides an admirable routine form of premedication for a large number of cases, and is, I think, of outstanding value in abdominal surgery, where the quietness of respiration, always so helpful in such cases, approximates to that which can be obtained with insufflation intra-tracheal anesthesia. By comparison with the morphine-atropine combination, it has several advantages. Both omnopon and scopolamine are sedative, whereas the sedative effect of morphine is to some extent neutralized by the stimulant effect of atropine. After omnopon-scopolamine the patient comes to the theatre asleep or sleepy, in a state approaching that of a true basal narcosis, and in most cases has little or no subsequent recollection of the anæsthetic. The patient premedicated with morphine and atropine rarely enjoys this advantage. Finally, omnopon has a less paralysing effect upon the bowel than has morphine—although in view of the fact that complete immobility of the bowel is present for some twenty-four hours after every abdominal operation, it is questionable whether morphine or any other opium derivative given before operation can be held responsible for any paralytic condition which subsequently gives rise to anxiety. In these days there is, of course, some doubt as to whether opiates do in fact constitute a menace to peristalsis. Recent research has suggested that the reverse may be the case, and that morphine actually conduces to the restoration of post-operative peristalsis and to the prevention of paralytic ileus.

This question of paralytic ileus suggests to me a further question. I do not think that anyone can tell us the whole
story of the causation of paralytic ileus. Undoubtedly a number of factors are involved; nevertheless its occurrence in many cases is unanticipated, and a matter of surprise in so far as no predisposing factors appear to be involved; explanation seems impossible. It appears reasonable to ask whether the anaesthetist has any responsibility at all in this matter of paralytic ileus. As far as I know, anaesthetists, though blamed for many things, are never held in any way responsible for this. But I think I have noticed that a number of patients in whom actual or threatened ileus occurs, are patients who by reason of physical characteristics or mode of life or other reasons, have at operation required more anaesthetic than the majority of people do. In other words, I seem to see a somewhat close resemblance between the type of patient who is prone to provide post-operative anxiety regarding intestinal function and the type whom one can recognize at sight as likely to require a relatively large amount of anaesthetic. One has heard a lot recently of acetyl-choline; at the moment I should be interested to know whether a toxic anaesthetic such as ether, given in quantity to a patient who requires a lot of it, may not cause an inhibition of production in the bowel wall of the acetyl-choline on which peristalsis is dependent. I don't know the answer to that question; nevertheless I can reasonably argue that if any responsibility does rest upon the anaesthetist in this matter, then he can retaliate by the use of premedication which will very appreciably reduce his patient's anaesthetic requirements.

The barbiturates have, in recent years, enjoyed much popularity as a medium for the provision of basal narcosis; and, I think, justifiably so. They have been criticized on the score that their effects vary so greatly in different patients as to render it quite impossible to formulate any definite plan by which the dose for an individual patient may be determined. While this is true of the oral administration of the barbiturates, the criticism is probably not entirely justified when the intravenous method is used. Provided there be no preconceived idea as to the amount to be injected, and provided that the injection is governed strictly by the reaction of the patient, there need be little
fear either of failure to secure the results desired or of the possibility of overdosage. Adequate and safe dosage can be secured for each individual patient. If a strictly controlled method of injection is employed, the procedure is comparable to the administration of a volatile anaesthetic by the drop method, where the adequacy of the effects produced on the one hand and the avoidance of overdosage on the other hand are the responsibility of the administrator, on whose knowledge and skill the safety of the patient depends. One need not speak, therefore, with undue solemnity, of the danger of injecting irrevocably into a patient's circulation a drug to which that patient may later exhibit an alarming idiosyncrasy, unless one is obsessed by the idea of standardization of dosage and forgetful of the possibility of suitting the dosage to the individual patient, as one does in the administration of any inhalation anaesthetic.

Personally, however, I have found little reason to be unduly critical of the administration of barbiturates by mouth on the score of unreliability of action. The barbiturate which, after a trial of many, I have found most useful is seconal—which is sodium propyl-methyl-carbinyl-allyl barbiturate and is made by the American firm of Lilly. I may have been fortunate, but I have rarely found that seconal given in a dosage of two or three capsules of 1/8 grains, fails to give the desired result. Thanks, no doubt, to its relative potency, the effects of seconal appear to me to be more consistent and reliable than those of any other barbiturate I have used. Its action is of short duration even when compared with other short-acting barbiturates. It is de-toxicated and eliminated in about two hours with an entire absence of undesirable effects in the form of excitement or restlessness. As in the case of other barbiturates, its absorption and therefore its effectiveness may be enhanced if its administration is associated with that of an alkali or alkaline mixture.

Nembutal, of course, is very well known to all of you; it appears to me to be less certain in its effects than is seconal. The suppositories of nembutal recently introduced for use in young children appear to give reasonably satis-
factory results at the time of operation, but their most con-
stant effect is a marked degree of drowsiness for some 36 
hours—a real disadvantage in the cases of tonsillectomy, in 
which I experimented hopefully with them. If the dosage 
is reduced to avoid post-operative drowsiness, it is inade-
quate for the fulfilment of the requirements of premedica-
tion.

The two rectal forms of premedication—avertin and 
paraldehyde—have the advantage of enabling one to make 
a confident and definite promise of complete oblivion to the 
nervous patient who demands it; with proper technique, 
these methods never fail, a claim which one really cannot 
make for other methods except perhaps the method of 
intravenous barbiturate administration.

Avertin may be the premedication method of choice for 
cases of toxic goitre. If there is truth in the claim that it is 
specifically antagonistic to thyrotoxin, it almost certainly 
is the method of choice. Apart, however, from cases of 
toxic goitre, my own fondness for rectal paraldehyde is 
probably responsible for a certain, though doubtless un-
justifiable, indifference to avertin. There is no doubt that 
paraldehyde is intrinsically a safer drug than avertin; some 
would assent, perhaps truly, that paraldehyde is the safest 
of all basal narcotics. It certainly causes no appreciable 
fall of blood-pressure, and no delay in the return of reflexes 
after operation. Some seven years ago I used paraldehyde 
in about one thousand consecutive cases, unselected, and of 
all types and ages. I was never given cause for anxiety. 
To-day I find in the premedication of young children one of 
the chief indications for the use of paraldehyde.

The physiological effects produced by these various 
drugs used for purposes of premedication vary, although 
the clinical results of their administration are similar. If 
morphine or omnopon are administered in the absence of 
pre-operative emotional elevation of metabolic rate, they 
render metabolism sub-normal, because they act as direct 
metabolic depressants; if the barbiturates are administered 
under similar circumstances, metabolic rate is practically 
unaffected, because they are not direct depressants, and 
reduce metabolic rate only when this is elevated by emo-
tional disturbance. In the case of toxic goitre, therefore, where the elevation of basal metabolism is characteristic of the disease and not merely the result of an emotional crisis, morphine and omnopon are often more effective than are the barbiturates; the amount of morphine or omnopon administered ought logically to be that amount which will reduce the metabolism to a more or less normal level—an amount which obviously must be greater than that which is given under ordinary circumstances of premedication. Hence we need have no hesitation in increasing the dose of omnopon in our goitre patients—indeed, we must do so if we are to achieve the main aim of premedication.

While the barbiturates, unlike the opium derivatives, depress metabolism only indirectly, they are superior in the matter of inhibiting reflex sympathetic hyper-activity. It is probable, therefore, that they provide a better safeguard against the occurrence of ventricular fibrillation than do morphine and omnopon. A protective action may likewise be claimed for atropine and scopolamine by virtue of their ability to diminish the sensitiveness of the vagus fibres to cardio-inhibitory impulses.

Respiratory depression is more marked after omnopon-scopolamine and avertin than after the barbiturates. Respiration is little affected by paraldehyde. Fall of blood-pressure is greatest after intravenous administration of the barbiturates. There is a less, though not inconsiderable, fall of blood-pressure after avertin; a small and transitory lowering follows the oral administration of the barbiturates; while after paraldehyde blood-pressure is little affected.

If I may indicate briefly my own preference in different types of cases, I would suggest first, that in abdominal surgery omnopon-scopolamine is admirable, irrespective of the anaesthetic to be employed. 1/3 gr. of omnopon and 1/150 gr. of scopolamine is suitable before open ether anaesthesia; the larger dose of 2/3 gr. of omnopon and 1/150 gr. of scopolamine is permissible before nitrous oxide-oxygen anaesthesia. To the uninitiated, the effects of the omnopon-scopolamine combination may be somewhat disconcerting owing to the marked respiratory depression and to the modification of the signs of anaesthetic
depth ordinarily provided by the eye. For the most part the omnopon effect predominates, resulting in a tendency for the pupil to remain small even in deep anaesthesia, but in a not inconsiderable number of cases the scopolamine effect predominates and the pupil tends to be dilated throughout. These anomalies are no handicap to the experienced anaesthetist; they are amply compensated for by the manner in which relaxation is obtained with comparatively little anaesthetic and by the quietness of the abdominal wall which is so extremely helpful to the surgeon.

The barbiturates, orally administered, are to my mind most useful in non-abdominal surgery in adults and in surgery of any sort in children over eight years of age. Individual susceptibility to barbiturates varies enormously, and there is no means by which the dose necessary by mouth can be determined.

The intravenous method of administration, as already mentioned, obviates this difficulty, since it renders it possible to give just that dose which, during injection, the effects of injection, carefully observed, show to be necessary. On the other hand, I think you will find that the young and healthy adult about to undergo, say, an operation for hernia, is in most cases satisfactorily prepared if 3 to 4½ grains of seconal have been given by mouth. At all events his metabolic rate has been lowered—and this I repeat is the most important of the effects produced by basal narcosis—and your task in administering the anaesthetic has become unquestionably easier.

The last-minute intravenous injection of evipan or pentothal sodium in small dosage is useful when circumstances have made it impossible for other premedication to be given with the usual time interval before operation.

Cases of toxic goitre, on account of an elevation in metabolic rate unknown in other surgical cases, are in a category by themselves. The requirements are, firstly, adequate lowering of metabolic rate to bring the patient to a state where no large amount of anaesthetic will be required, and secondly, the use of a non-toxic anaesthetic—that is to say nitrous oxide with no added ether. The
modern technique of adequate premedication, local anaesthesia and pure gas-oxygen anaesthesia has vastly improved the prospects of the goitre patient. As to the premedication, perhaps avertin is best; I am prepared to believe that, but very satisfactory also is omnopon-scopolamine with the omnopon repeated according to metabolic requirements. The subsequent inhalation anaesthetic must be nitrous oxide; ether is really as unjustifiable as it is unnecessary; the popular argument as to the permissibility or otherwise of intra-tracheal administration need not be discussed; permissible or not, it is rarely necessary. May I say with diffidence to those of you who use paraldehyde for your goitre cases that it may not be entirely logical to deal with those cases which have a metabolic rate much higher than any others which you encounter in the operating theatre, with that form of basal narcosis which does less towards the direct lowering of metabolic rate than almost any of the other drugs in common use.

Young children must be premedicated for two reasons —firstly, because it is a duty to spare these little patients unpleasantness, and secondly, because in many cases their parents, having studied the Sunday newspapers, are experts in the matter of premedication, and often demand promises from the anaesthetist. Now the commonest operation in young children, and, in my experience, the one most frequently the subject of parental demands, is the operation for removal of tonsils and adenoids. Here the rapid return of the cough reflex after operation is of great importance. Fortunately rectal paraldehyde combines the advantages of enabling us to make confident promises to exacting parents, and of doing nothing whatever towards inhibiting the rapid return of the cough reflex after the operation. Given a tactful nurse to attend to the administration of the paraldehyde, it is to my mind undoubtedly the method of choice in young children. Amnesia at least is nearly always secured by a dosage no higher than that of half a drachm per stone of body weight, and no element of risk whatever is present. I know many children, thus premedicated, who are blissfully unaware that they ever had an operation.
Premedication

In conclusion I would say that premedication and basal narcosis is far more than a concession to the admitted unpleasantness of inhalation anaesthesia. It is a proceeding which on physiological grounds is so sound as to be not merely helpful or desirable but actually almost essential. I am convinced that from every point of view it constitutes a duty on the part of the anaesthetist. Carried out with the conservatism that safety demands in the administration of any drug, it is productive of nothing but benefit to everyone concerned; conservative premedication is almost always adequate for what one wishes to achieve: the somewhat heroic forms of basal narcosis of which one infrequently hears and reads are not only unnecessary, but are probably responsible for the grave warnings which have been issued as to the dangers of basal narcosis. The statistics which support these warnings appear impressive until one remembers that consistent immoderate use of any drug could be made to provide similar impressive statistics of unhappy consequences. Fortunately clinical experience proves what physiological considerations suggest, namely that basal narcosis withholds none of its blessings even when used with a conservatism which demands that the limits of safety should at all times be recognized and respected.