PREOPERATIVE MEDICATION FOR CHILDREN*

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INTRODUCTION

THE PROBLEM of premedication in children is one which vexes many anaesthetists. It is one which requires a sensible rather than a sentimental approach. It is not at all the same problem that it is in adults, although many of the answers to it can be found in any reasonable attitude towards the matter of preoperative medication in older patients.

First of all, those responsible must ask themselves what they hope to accomplish by giving drugs to the patient before operation. It is admittedly desirable to have the patient arrive in the operating room in as quiet and composed a state as possible. It is also sometimes desirable to have the preoperative medication act as a supplement to the anaesthetic agents which one plans to use. In addition, the drugs given before operation may have a beneficial controlling effect on some of the undesirable effects of the anaesthetic agent or agents.

It is in the first category that the needs and requirements of children differ from those of adults, and it is also the category over which most of the controversies on the subject rage. Children, as a rule, have not been taught, nor have they learned, either to control their fears or their emotions, or their reactions to a new and strange environment, to which they are removed from the comforting support of parents, and where they find themselves under the supervision and care of strangers. Babies react hardly at all to the break from life in the home to that of the hospital, provided their routines of feeding and rest are not altered too much. Children from two years onward, until they have started to attend school and have made a readjustment to a period of time spent away from parents and home, are the ones that usually suffer most from a trip to the hospital. Children of school age, on the other hand, usually adjust quite readily and the problem with them is in providing interest along with sympathetic care from those who attend them. No one, observing this group on the wards and in the playrooms, would suggest that they are unhappy. Indeed many of them find the hospital more interesting than the home and some have even simulated recurrences of their illnesses to get back into hospital.

The adult patient of reasonable imaginative powers usually decides to submit to operative and anaesthetic procedures of his own volition, after having the needs for operation explained and the alternatives outlined. He will probably have some fears as to the successful outcome. It is not surprising, therefore, if he is in hospital, that some form of sedation and hypnosis is provided for the evening before operation or that medication of some sort is prescribed for the period before operation, for the combined purposes of acting as a sedative and as an analgesic to obtund pain which may be disturbing to him. This premedication

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usually takes into consideration the need for employing drugs of the belladonna group, the desirable pharmacological effects of which are depression of salivary and bronchial secretions, relaxation of larynx and bronchi, and depression of vagal reflexes. The dosages of these drugs or combinations of drugs are well established for adults and are varied to fit the needs of the individual patient. The premedication might include drugs such as digitalis, which, in the cases for which it is desirable, may convert a poor operative risk into a better one. Attention to fluid and electrolyte balance might also be included in the orbit of preoperative medication but no discussion of this point will be made in this paper.

The requirements of children with regard to analgesic drugs and drugs of the belladonna group will be based on the same criteria as for adults. Analgesics may be employed for both sedation and relief of pain preoperatively. If pain is not present, drugs of the barbiturate group, usually of the short acting type, may be employed for their hypnotic effect. They will be of little value if pain is present and may even increase the degree of excitement under such circumstances.

Analgesics may also be prescribed as part of the premedication, in the absence of preoperative pain, to act as supplements to or to augment the analgesic properties of such anaesthetic agents as nitrous oxide, where the surgical procedure may result in more painful stimuli and where for one reason or another it is undesirable to employ cyclopropane or ether.

The attitude of sympathy for, and tenderness towards, the sufferings of children is almost universal. There is therefore a very natural desire to spare children many of the discomforts and disabilities that adults accept as being almost normal. The decisions with regard to operations in children are made by the parent. The child has few worries or concerns about his immediate future and unless his imagination and fears are deliberately aroused, the night before operation is no different from any other, except that he may spend it in a strange bed in a strange room. His requirements for sedation or hypnosis the night before operation are almost negligible.

One hears and reads much of the "Psychic Trauma" suffered by children, subjected to the mercy of anaesthesia for the performance of painful surgery. I must confess that I am a "doubting Thomas" as to the reality of this condition. There have been suggestions that children who have spent some time in hospital, where they have had operations under general anaesthesia, may revert to thumb sucking, bed-wetting, night fears and the like. These occurrences are chiefly observed in the pre-school group, three to five years in age. I believe they might as properly be blamed on the separation from a fond and indulgent parent, who has failed to develop a sense of stoicism towards mild discomforts and a degree of independence from constant parental attention, as on the administration of an anaesthetic. At least, in my thirty years of experience in Paediatric Anaesthesia, "trauma" has not been of sufficient moment for our child psychologists to do anything more than talk vaguely about it. Our experience certainly has not led to any scientific proof that the administration of an anaesthetic alone was the cause of subsequent psychic disorders. On circumstantial evidence it would be as

easy to prove that the condition is most prevalent in children of parents who have failed to train them for life in a society where not only they, but other children, and adults, have to be given consideration, and where occasional experiences of pain must be tolerated with some degree of stoicism.

The majority of normal children offer very little trouble, under ordinary circumstances, if the anaesthetist approaches them with intelligence and understanding. Every effort should be made to establish confidence on the part of the small patient. Where possible the procedures to be employed should be explained in terms the child can understand, and no promises of freedom from pain or discomfort should be made, unless one is sure of being able to keep such promises. More harm is done to the psyche of children by false promises and deceit on the part of adults than by a brief moment of pain, pain being one of the disciplines that few if any ever completely avoid.

A very small minority of children show unreasoning fear or an attitude of total resistance to every approach made to them. A fearful or indulgent parent is frequently the underlying cause, and in some cases I firmly believe that sedation of some sort for the parent would be a good start, in approaching the child's problem. With this small group, it will make trifling difference how one approaches the initial problem of giving a sedative. Come with a syringe for intramuscular or intravenous medication, and one meets hysterical resistance which one is reluctant to overcome, no matter how gently the necessary force is applied. Rectal administration may be resented and opposed with equal resistance and may be quite ineffectual because of expulsion of the drug. Administration by mouth may be ineffective for the same reasons. All of these resistances are usually at their maximum level if a parent is present. Sometimes the removal of the parent from the scene and a decisive approach accompanied by vocal firmness often produces a surprising co-operativeness. It goes without saying that all forms of restraint or coercion should be applied as gently as possible.

DRUGS, DOSAGE, AND METHODS OF ADMINISTRATION

At the Hospital for Sick Children we do not employ a very long list of drugs for premedication. For hypnosis and sedation we use the barbiturates of the short-acting group. The choice is usually either Nembutal or Seconal. These may be given by mouth or by rectum. In some respects the rectal route is the more dependable of the two. Nembutal suppositories of $\frac{1}{2}$ gr., 1 gr., 2 gr., and 3 gr. strengths are available, and are more dependable than the ordinary capsules of either Nembutal or Seconal for rectal administration. An enema the night before operation will make for more satisfactory results. This applies, also, if it is desirable to administer rectal Pentothal or Avertin as a basal narcotic agent. The former has almost supplanted the latter for this purpose, and may be given as either a 10 per cent or 5 per cent solution in water or saline in dosages of 15 to 20 mgm. per pound body weight. With this dosage, the child usually falls asleep in five to fifteen minutes following the injection. This method

of administration of Pentothal finds only limited application with us, and it is possible that we are neglecting a useful procedure because we find it more time-consuming than other methods. We cannot, as yet, bring ourselves to feel happy about leaving the injection and post-injection care to nursing personnel. If we use rectal Pentothal, we give it ourselves, and stay with the patient until the end of operation and his return to the recovery room.

At the present time, drugs of the analgesic group are used in the following order of frequency. (1) Demerol, (2) Codeine, (3) Morphine. Morphine is used only occasionally and, of the opiates, Codeine finds a wider preference. Demerol as an analgesic lends itself favourably to paediatric practice. It can be given subcutaneously, intramuscularly, or intravenously with or without atropine, the favourable actions of which it supplements. It does not seem to depress the respiratory centre to the same degree as the opiates do. It is safe to give children up to 1 mgm per pound of body weight, but usually one-third less than this dose is used before operation. Codeine may be given by mouth, but is more effective, as an analgesic, given subcutaneously or intramuscularly. Morphine is given subcutaneously, intramuscularly, or intravenously.

As a drying agent we prefer Atropine to Hyoscine. With Hyoscine we have had, in the past, a higher incidence of excitement and undesirable cardiovascular reactions than with Atropine. Atropine in suitable dosage may be combined with Demerol or given separately, either intramuscularly or intravenously.

When these agents are given subcutaneously they should be administered at least one hour before operation. If given intramuscularly, forty-five minutes to half an hour is usually sufficient time for their effect to become evident. In emergencies, or where otherwise desirable, the intravenous route may be used, five to ten minutes before starting the anaesthetic. Much of the discomfort associated with injections may be prevented by drying the skin area after sterilization and using a sharp, small gauge needle.

In deciding what preoperative medication to order for each patient, the following factors must be taken into consideration: the physical condition of the patient, his temperament and nervous stability, the degree of apprehension or fear, the presence or absence of pain, the operative procedure anticipated, and the anaesthetic technique to be employed. The weight is more important than the age in deciding the dosage of the drugs to be used. In general, the metabolic rate rises from birth to the sixth year. It declines from the sixth year up to the onset of puberty, during which it again rises slightly, to subside to the adult level at the end of puberty. Some consideration of the age may result in an adjustment of the dose figured from weight. The physical state of the patient will also play a part in the decision. The vigorous, active, or high strung child will require the upper range of dosages, while the pale, lethargic, and listless child will require only minimal levels.

The presence or absence of pain, the anticipation of pain, or a desire to augment the analgesic properties of an anaesthetic agent such as nitrous oxide, are the only sound reasons for including analgesic drugs in the premedication. It may be desirable in many paediatric operations to provide a non-flammable

and non-explosive technique. In these cases, intravenous Pentothal and relaxants, associated with nitrous oxide-oxygen anaesthesia, with possibly trichlorethylene added, is likely to be the anaesthetic method chosen and one of the belladonna alkaloids will be a necessary part of the premedication. If the operation is to be long, larger doses of Demerol, or supplementary ones, given intravenously during operation, may prevent too much dependence on the analgesic properties of trichlorethylene and an abuse of its undeniable advantages for operations of medium or short duration. The continuous use of this agent during long operations may lead to cumulative toxic effects.

Table I giving dosages for the agents mentioned should be used with the above stipulations in mind. The doses given are well within the safe and effective range for the weights given.

Paediatric anaesthesia has made immense strides in the past decade and a half. The rapid development of intravenous agents during the war years and the

TABLE I
DOSAGE TABLE

Age	Weight	Hypnotics	Analgesics		
		Barbiturates Oral or Rectal	Opiates By Hypo or IM	Demerol IM or IV	Atropine IM or IV
1 month and under	10 lb and under				1/400 Gr
2 months to 1 year	10 lb to 20 lb	Nembutal $\frac{1}{4}$ to $\frac{1}{2}$ Gr or Seconal $\frac{1}{8}$ to $\frac{1}{4}$ Gr	Codeine sulph $\frac{1}{8}$ to $\frac{1}{4}$ Gr	10 to 15 mgm	1/300 Gr
1 year to 4 years	20 lb to 40 lb	Nembutal $\frac{1}{2}$ to $\frac{3}{4}$ Gr or Seconal $\frac{1}{4}$ to $\frac{1}{2}$ Gr	Codeine sulph $\frac{1}{4}$ to $\frac{1}{2}$ Gr	15 to 35 mgm	1/200 Gr
5 years to 12 years	40 lb to 80 lb	Nembutal $\frac{3}{4}$ to 1 Gr or Seconal $\frac{1}{2}$ to $\frac{3}{4}$ Gr	Morphine sulph 1/12 to $\frac{1}{8}$ Gr or Codeine sulph $\frac{1}{2}$ to $\frac{3}{4}$ Gr	35 to 70 mgm	1/150 Gr
12 years and over	80 lb and over	Nembutal 1 Gr to $1\frac{1}{2}$ Gr or Seconal $\frac{3}{4}$ to 1 Gr	Morphine sulph $\frac{1}{8}$ to $\frac{1}{6}$ Gr or Codeine sulph $\frac{3}{4}$ to 1 Gr	75 to 100 mgm	1/100 Gr

stimulus to civilian practice given by the younger generation of anaesthetists produced by the exigencies of war, had a profound effect, which, in the immediate post-war years, extended to a complete reorientation in paediatric methods. Endotracheal techniques, which had been a very esoteric procedure, became a commonplace, to such an extent that a new generation of anaesthetists has grown up who find it difficult to maintain satisfactory anaesthesia without the use of endotracheal methods. Relaxant drugs, of long or short action, along with intravenous barbiturates, have almost removed ether as an inhalation agent from adult practice. We still find, however, that ether is a useful and in some cases an indispensable agent in paediatric practice. For example, at the Hospital for Sick Children, Toronto, where we do anywhere from twenty to thirty tonsil operations a day, Ethyl chloride (occasionally Vinethene) Ether-oxygen anaesthesia is used in all but a small percentage of cases. Routine premedication is not used and intubation is only done on patients who are so large that control with a mouth hook might be difficult. Our nose and throat surgeons are quite happy with these methods and since postoperative pulmonary complications after tonsillectomies are non-existent in our institution, they have every reason to feel satisfied. A few children may have a short-acting barbiturate prescribed by the paediatrician before coming to hospital. Occasionally for very apprehensive children Nembutal suppositories may be given an hour or more before the time of operation, and with extreme rarity we may provide basal narcosis with rectal Pentothal. One of the chief factors which contributes to our freedom from aspiration complications is a prompt return of the cough reflex at the end of operation. No patient is removed from the operating table until he has coughed. For this reason, drugs of the opiate group are not used for our tonsil cases.

It is hard to say how much advantage is gained by the administration of barbiturates in these cases. Possibly the induction stage is quieter and more rapid than it would be without the barbiturate, but the recovery period is also somewhat prolonged. Most of these patients arrive at the Hospital as ambulatory cases, one half to one hour before the time set for operation. A few cases have been unstable enough, from their barbiturate, to have sustained falls with minor injuries. The advantages come out about even with the disadvantages, and the total effect might be just as good if the apprehensive parent were given double the dosage prescribed for the child and the drug withheld from the patient.

Cases booked for eye operations receive Atropine alone, and as many of these cases receive ether the upper ranges of dosages are usually ordered.

Newer anaesthetic techniques, which are likely to be employed in such major surgical procedures as lobectomies, pneumonectomies, the various operations presently in vogue for the correction of congenital cardiovascular conditions, and some neuro-surgical conditions, have added to the requirements for satisfactory pre-operative premedication. In most of these cases it is desirable to have the patient arrive in the operating theatre in a placid state of indifference, and for him to enjoy a prolonged period, after operation, free from the disturbance of vomiting or discomfort. Fortunately some of the newer drugs have come to our aid for satisfying these conditions. These newer anaesthetic techniques may

resort to either hypothermia or extra-corporeal circulations for the accomplishment of surgical procedures in a quiet or relatively bloodless field for appreciable periods of time. During the operation itself and for a period afterward the conditions may be precarious because of the profound disturbances in physiological function.

Dr. Code Smith (1) has proposed the following method of premedication in such cases. Cardiac patients, if in failure, are digitalized for several days. At six P.M. the night before operation chlorpromazine and promethazine hydrochloride, 1 mgm. of each for each three pounds in weight, are given by mouth to larger children and intramuscularly to smaller children. This dose is repeated at midnight and again at six A.M. Atropine in suitable doses is given intramuscularly forty-five minutes before operation. This produces a variable degree of sedation which may be augmented by doses of M(1) mixture of Laborit and Huguenard, (2) equal volumes, Chlorpromazine, Promethazine, and Demerol, yielding 8.3 mgm Chlorpromazine, 8.3 mgm Promethazine and 16.7 mgm. of Demerol per cc—the average dose of which is 1 cc per 25 pounds. This is given in fractional doses, to the point where the patient can still be aroused, but falls asleep if undisturbed. This premedication provides a basis for minimal anaesthesia with a rapid return to consciousness and an adequate voluntary respiratory exchange, with little or no postoperative vomiting, and little requirement for further postoperative sedation.

A relatively limited list of drugs for preoperative medication in children has been suggested. We believe that sympathetic and understanding care on the part of nurses and doctors with the provision of interesting and diverting surroundings do much to reduce the need for sedation in children unless pain is present. At the Hospital for Sick Children, we have found it of great advantage to have, incorporated in our operating room floor, a reception-play room for children coming from the wards, where they may spend the short time before being transferred to the operating room itself. This room has interesting murals painted on the walls and has a plentiful supply of toys for younger children and illustrated comics for the older ones. It is staffed by capable ward aids, who usually manage to gain the interest of the children and keep them diverted from a sense of strangeness or fear. A similar play room is part of our tonsil suite. Here preoperative patients show little need for sedation.

SUMMARY

The problem of preoperative medication in children is discussed. The various conditions which influence the choice of drugs and their dosages are considered. A list of the drugs in everyday use at the Hospital for Sick Children is given. So-called "Psychic Trauma" in paediatric anaesthesia receives some consideration but is dismissed as being of negligible importance. A brief résumé of the premedication used in anaesthesia for surgical corrections of congenital heart disease is included.

RÉSUMÉ

Nous avons traité de la médication préopératoire chez les enfants. Nous avons envisagé les diverses situations qui peuvent influencer le choix des médicaments ainsi que leur dosage. Nous avons présenté la liste des médicaments en usage quotidien à l'Hôpital des Enfants malades. Nous avons porté une attention spéciale à ce qu'on appelle, en anesthésie pédiatrique, le trauma psychique mais nous avons vite discontinué cette attention parce que nous considérons que ce problème n'a qu'un intérêt négligeable. Nous avons également mentionné, en résumé, la prémédication que nous employons en vue de la chirurgie correctrice des maladies cardiaques congénitales.

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