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PEDIATRIC ANESTHESIA

edited by Robert M. Smith, M.D.

**from The Children's Hospital
Medical Center, Boston**

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PUBLISHER'S NOTE

With this volume we launch a new quarterly subscription series, *INTERNATIONAL ANESTHESIOLOGY CLINICS*. We hope that you will like it. In order for these volumes to be as useful as possible, each will confine itself to one or two topics in the form of symposia. The material will be presented in a direct, easy-to-comprehend manner. It is our hope that in this way the clinician will have ready at hand practical, authoritative advice (while it is still fresh) that he can promptly put to use in his own practice.

After speaking about the concept of the *CLINICS* with a great number of anesthesiologists it became apparent that there is an eager audience for the kinds of symposia we have planned. Some will stress the clinical approach; others will deal with the basic sciences as they relate to practice in anesthesiology.

Each issue will be written by authorities from leading centers in this country and abroad so that a truly international look at the field can be had. We want to present symposia you will want to read. Please let us know what subjects you would like covered; the *CLINICS* are designed for you, the reader, and we want them to reflect your needs and desires.

We would like to think that the *CLINICS* will provide enjoyable and relaxing reading as well as practical information. The format has been planned with easily read, large type and ample illustrations.

How fitting that our first issue should come from Boston, the home of anesthesia. We thank Dr. Robert M. Smith and his

contributors for the excellent job they have done. Dr. Smith, who approached his editorial duties with vigor and enthusiasm, was able to call forth the best from his group. We especially admire his taking on the task of preparing the first number in a series that heretofore had been only an idea. He grasped readily what we were attempting, then proceeded to get it done.

THE PUBLISHERS

Atque audacibus adnue coeptis.

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PREFACE

Because of the role played by Boston in the launching of anesthesia, the publishers wished to have the first volume of the INTERNATIONAL ANESTHESIOLOGY CLINICS assembled in this area. It was also the publisher's plan to have one section of the volume devoted to basic considerations and a second section that should represent the actual types of anesthetic management as practiced by different groups in this vicinity. To be presented with such a proposition and such a short period of time in which to send a complete volume to press has imposed difficulties on all concerned. However, the original plan of execution has been carried out with little if any deviation.

This symposium has been compiled with the intent to supplement rather than duplicate existing texts on pediatric anesthesia. Instead of a highly repetitive review of all phases of the subject, only those topics thought to have special current importance have been chosen. By choosing a relatively small number of subjects, it has been possible to develop them much more completely than if an attempt had been made to cover all aspects of pediatric anesthesia.

In the first section, emphasis is first focused on neurologic and radiologic aspects of pediatrics. The importance of these factors

has long been overlooked in the teaching and practice of our subspecialty. The continuing activity in the field of respiratory physiology and the immediate value of this information to anesthesiologists is obvious. In cardiology, the relatively difficult subject of pulmonary arterial hypertension was chosen because this problem looms as one of the greatest obstacles in dealing with cardiac patients of all ages. Careful scrutiny of the information and references offered in this chapter should be highly rewarding. In both sections, fluid and blood replacement has been given wide coverage. The concepts of the renal physiologist, the transfusionist, and the pediatric surgeon are presented in a three-cornered combination that should be difficult to equal.

The remaining topics in the latter half of the volume relate chiefly to technical problems. Stress has been placed upon ventilation and safety factors, plus consideration of a few of the most important of the newer developments such as halothane and the technique of hypothermia.

In the preparation of this volume, I have had the most remarkable coöperation, and I wish to express my sincere gratitude to all the contributors, both for accepting their tasks and for completing them with such excellence. Special thanks are due to those outside of the field of anesthesia who contributed heavily to the value of the presentation. Dr. Richmond Paine, who was in the process of moving to a new post in Washington, D.C., deserves an extra vote of appreciation.

The publishers have done everything possible to facilitate the work and have been most considerate. Acknowledgement is due also to Miss Gretchen Jessup, who provided much help in preparation of data and manuscript, and to Miss Shirleen Adams, who did much of the stenographic work. Dr. Thomas Burnap, consultant and proofreader, was responsible for much of the final shaping of the text.

ROBERT M. SMITH

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DEVELOPMENTAL AND PATHOLOGIC PHYSIOLOGY IN INFANTS AND CHILDREN

DETECTION OF NEUROLOGIC ABNORMALITIES IN YOUNG INFANTS

Richmond S. Paine

IT IS SELF-EVIDENT THAT ABNORMALITIES of the nervous system have important implications for patients' reactions to the anesthesia and for the plans of the anesthesiologist. Other authors in this volume will discuss the management of anesthesia in the presence of neurologic and other complications; the purpose of the present article is to provide a basis for recognition of neurologic abnormality in the early months of life. The conventional methods of examination of the nervous system and the accepted implications of the traditional signs have only a limited and modified application to the first few months of life. It is obvious that ingenuity is required to adapt standard techniques to the examination of this age group. In addition, the examiner must understand and take advantage of the automatisms and postural reflexes peculiar to this age period.

Only occasionally will it be possible to arrive at a diagnosis such as a localized cerebral vascular lesion as might be recognized in adults. Far more often the newborn and young infant suffers from a global disturbance of the central nervous system as a whole. Symptomatology may be diffuse from even relatively localized lesions and, conversely, localized signs such as focal convulsions may result from general or biochemical causes. Thus, our available methods of examination are not so inadequate as might first appear, at least in regard to detection of abnormalities of the types most frequently encountered. In spite of recent

increased interest in this field, much remains to be learned, and very often no diagnosis can be made other than that of a general depression of most or all functions of the central nervous system as a whole. Such a patient is plausibly going to present problems in connection with anesthesia and his recognition is therefore of use, even to such a nonspecific degree.

NEUROLOGIC EXAMINATION OF NEWBORN AND YOUNG INFANTS

Examination should begin by observation of the infant at rest, without disturbing him or at least with minimal handling, directing attention at the degree of alertness, the position and movement of the eyes and face, the posture of the body at rest, and the spontaneous activity. The examiner then proceeds to the testing of various responses, beginning with those least disturbing to the infant or with those the examiner suspects will be of greatest importance from any known medical history. The order of examination will vary according to these circumstances and also according to the state of the infant at the beginning of the examination. Obviously, the less pleasant items should be left until the end. However, while the examination will be performed in an order varying with the situation, it is desirable to record the findings in a systematic and orderly way for the sake of ease in evaluating them. One acceptable scheme is given in Table I, which is an adaptation of a conventional recording plan for adults.

In conducting the examination, the physician should bear in mind the notorious variability of the normal newborn infant from one period of time to another. Signs may appear, vanish, and reappear, all in a matter of hours. Neurologic abnormality usually tends to produce a general trend toward greater uniformity and many phenomena that one would pass over as normal variations on a single occasion assume much greater significance if stereotyped and constant. Thus, questioning of the residents and nurses as to observations on other occasions or as to confirmation of what the examiner finds on a single observation is an important adjunct to evaluation of doubtful situations. This is

particularly true in regard to spontaneous movements, cry, position of the eyes, and feeding.

Much of our knowledge of neurologic abnormalities in the early months of life rests on the work of Peiper (9) and André-Thomas (14). Neither of these works is available in English but briefer discussions have recently been published (11, 8). A number of comments may be worth while concerning individual sections of the examination, taking the order given in Table I.

MENTAL STATE

This appraisal is less complex than in adults, even if more subjective. It is very difficult to be certain whether newborn infants are awake or asleep but the examiner must clearly rule out coma or stupor. An over-all impression of alertness or apathy may be gained for impressions of hyperirritability or anxiety. Fear of the examiner is a normal phenomenon in the case of an intelligent, physically helpless infant and lack of apprehension may suggest depressed mentation, although this is more true at later ages.

CRY

Crying is normally variable from one time to another in strength, pitch, and character. Abnormalities to be looked for include a stereotyped nonvarying cry, in addition to such deviations as a feeble or abnormally high-pitched, shrill cry.

POSTURE AT REST

Certain localized neurologic abnormalities such as brachial palsies may be strongly suspected from the posture of the limbs when the infant is at rest. (The upper or Erb type of palsy is sometimes accompanied by unilateral diaphragmatic paralysis, with obvious anesthetic implications.) A rigid or opisthotonic baby gives us clear evidence of meningeal irritation or of an irritative abnormality of the central nervous system as a whole. The converse, the lethargic, limp child who lies in the "pithed frog posture," with paucity of spontaneous movement, most often reflects general depression of central nervous system activity as a whole.

TABLE I
RECORD OF NEUROLOGIC EXAMINATION OF YOUNG INFANTS

Mental state:	Alertness Irritability Anxiety
Cry:	Strength Pitch Character
Posture at rest	
Spontaneous activity:	Quantity Quality (lethargy versus "jitteriness") Symmetry Abnormal movements (seizures, myoclonus)
Head:	Size Shape Fontanelle Sutures Auscultation Transillumination
Neck:	Stiffness Head control in vertical posture Head retraction in lateral posture
<i>Special senses</i>	
Vision:	Response to persons Response to objects Response to light (following, blink reflex, pupils) Response to menacing gestures Response to covering of one eye Opticokinetic nystagmus
Hearing:	Response to handclap Response to fainter sounds
(Taste, smell)	
<i>Cranial nerves</i>	
IIIrd, IVth, VIth:	Position of eyes at rest Forced deviation Spontaneous movements Rotational nystagmus
Vth:	Jaw movement, sucking Corneal reflex
