SPA

Society for Pediatric Anesthesia
NEWSLETTER

Volume 4 Number 1 January, 1991

PRESIDENT'S ADDRESS

By Aubrey Maze, M.B.

After a beginning that can only be described as "catch-as-catch-can," your Society has grown into a vibrant organization which has and will continue to provide a link between members of ASA who are involved in administering anesthesia to the pediatric patient. There are now in excess of 900 members in the Society for Pediatric Anesthesia (SPA).

The SPA Annual Meeting last October in Las Vegas was an unqualified success attended by 345 members. The lectures as well as the camaraderie established were the basis for the success of the meeting. A full summary of the meeting is included in this newsletter.

SPA must continue to be a source of education as well as an open group where diverse opinions are expressed and sometimes even tolerated. Herein lies the strength of the Society. In order to accomplish these goals, SPA needs input from all its members. The lines of communication have been expressed through the watchful eye of the newsletter's editor, Randall C. Wetzel, M.D. Over the last few years, he has put together excellent summaries of the meetings and journal articles pertinent to pediatric anesthesia. All members who have ideas or issues they would like to "air" should contact Randall who will address your request.

We have elected three new members, Mark A. Rockoff, M.D., Jerrold Lerman, M.D. and Anne Marie Lynn, M.D. to the Board, and we have sent into "retirement" four members, Milton H. Alper, M.D., Robert K. Crone, M.D., John J. Downes, Jr., M.D. and Theodore W. Striker, M.D. As SPA President, Bob Crone was instrumental in arranging the initial Annual Meetings. All these Board members were present at the inception of the Society and, in their own different ways, have had a positive influence on the practice of pediatric anesthesia as well as on the direction your Society has taken.

The next few years will continue to be exciting for the Society as we embark on new projects. We have a delegate to the ASA House of Delegates who can be aware of issues that may relate to our Society. Many of you will be contacted to assist in accumulating data regarding the scope of pediatric anesthesia in the United States and Canada and, hopefully, this will enable us to acquire meaningful data regarding morbidity and what the future will hold for members of the Society.

In May, 1992, the Society will have a joint

Aubrey Maze, M.B.

meeting with the American Pediatric Surgical Association, which is the surgical equivalent of SPA. The tentative dates are May 13-16, 1992. We will soon begin drawing up the program and speakers, and we hope that many of you will attend what promises to be a memorable meeting with our surgical colleagues.

In the fall of 1992 at the ASA Annual Meeting in New Orleans, SPA will conduct a joint meeting with the Section on Anesthesiology of the American Academy of Pediatrics and the British Society of Pediatric Anaesthesia. This unique meeting, which will be held

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ANNUAL MEETING SUMMARY

By Randall C. Wetzel, M.D.

The Fourth Annual Society for Pediatric Anesthesia Scientific Meeting was, in the tradition of the previous years, a resounding success. More than 300 pediatric anesthesiologists from around the world participated in the meeting in October, in spite of the various distractions of Las Vegas. Under the watchful eye of out-going President, ***Robert K. Crone, M.D.,*** *and the current President,* ***Aubrey Maze, M.B.,*** *the meeting was managed to the great satisfaction of all.*

Morning Session

Many old friends had time to meet over a scrumptious continental breakfast which started the day splendidly. Dr. Crone hosted the morning session with his usual aplomb. This session highlighted "The Development of The Respiratory System: Clinical Implications for the Pediatric Anesthesiologist." A panel of distinguished experts led the assembled pediatric anesthesiologists through a stimulating and informative morning, investigating many aspects of the importance of the respiratory system and its development in pediatric anesthesia.

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Martin Joyce-Brady, M.D., Assistant Professor of Medicine, Pulmonary Center of Boston University School of Medicine and Boston City Hospital, presented the first exciting presentation on the biology of lung development and how the principles of lung development have physiologic consequences of relevance to the anesthesiologist.

The importance of surfactant formation on the ultimate structural development of the lungs

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SPA Contents

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Dues and Costs

Membership dues for the Society for Pediatric Anesthesia are $100 per fiscal year. The costs of the SPA Annual Meeting (guest speaker stipends, meeting place expenses and food) are underwritten by membership dues and by generous contributions from corporate donations and sponsors. For more information, interested physicians should write to:

THE SOCIETY FOR
PEDIATRIC ANESTHESIA
515 Busse Highway
Park Ridge, IL 60068-3189

Editorial Reorganization

The editorial staff of the SPA Newsletter has been reorganized. Randall C. Wetzel, M.D. of The Johns Hopkins Hospital, Baltimore, Maryland, is the editor. Robert M. Spear, M.D. of Children's Hospital in San Diego, California will be joining James P. Viney, M.D. of Primary Children's Hospital, Salt Lake City, Utah as assistant co-editors of "Literature Review." Steve M. Audenaert, M.D. of the University of Kentucky Medical Center in Lexington, Kentucky, will continue as assistant editor for "Pearls and Perils."

The Editor wishes to thank those who attended the October, 1990 SPA meeting and who volunteered to contribute to future issues of the SPA Newsletter. You will be called upon to serve! — *RCW*

PRESIDENT'S ADDRESS

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the Friday prior to the start of the ASA meeting, will have an international flavor, featuring speakers from both continents.

This year, SPA will hold its Annual Meeting on Friday, October 25, 1991, in the "City by the Bay," San Francisco, California. The morning session will be devoted to the cardiovascular aspects of pediatric anesthesia, while the afternoon session will focus on controversies and short subjects within our specialty. We are coordinating these subjects with those topics scheduled for the ASA Refresher Courses and panel discussion sessions in an effort to minimize repetition.

This past year, Ron Bruns, ASA Director of Member Services, was loaned to us for administrative leadership. The position of Special Services Manager has been assumed by Gary W. Hoormann, who already has brought along some excellent ideas. Gary can be contacted through the ASA office in Park Ridge, Illinois.

Members who are working on special projects should make the Society's Board of Directors aware of their efforts. Wherever possible and if deemed appropriate, the Board will provide assistance.

Corporate sponsors continue to provide financial assistance to the Society, but as the financial times change, so have their responses. Any member who has specific contacts with corporations willing to assist the Society is asked to contact me through the SPA office. We will follow up and coordinate your efforts.

New members are always welcome, including Fellows in pediatric anesthesia and third-year residents who have an interest in pediatric anesthesia. We hope that all present members will assist the Society in its endeavor to increase membership.

Once again, I thank you for bestowing upon me the honor of being President of your Society. I hope that together we can accomplish the goals of the Society.

The Board and I hope that all members had a pleasant holiday season, and we wish you good health and happiness for the New Year. ❑

SPA ELECTION RESULTS

Members of the Society for Pediatric Anesthesia (SPA) who attended the Society's Annual Membership Meeting last October in Las Vegas, Nevada, were called upon to elect officers and directors.

The nominations were presented by Nominating Committee Chairman Aubrey Maze, M.B., Phoenix, Arizona. The results of the election are as follows:

Vice-President	Charles H. Lockhart, M.D. Denver, Colorado
Secretary	William J. Greeley, M.D. Durham, North Carolina
Treasurer	Mark A. Rockoff, M.D. Boston, Massachusetts
Directors	Jerrold Lerman, M.D. Toronto, Ontario, Canada
	Anne Marie Lynn, M.D. Seattle, Washington
	Frederic A. Berry, Jr., M.D. Charlottesville, Virginia

Following the election, Dr. Maze was installed as SPA President for 1990-91. As his first official act of business as President, Dr. Maze presented a plaque to outgoing President Robert K. Crone, M.D., Seattle, Washington, in honor of his service as the Society's chief elected officer in 1989-90. ❑

ANNUAL MEETING SUMMARY

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was highlighted. Alveolar type II cells produce the lamellar bodies that contain glycoprotein (sphingomyelin A,B and C). These form a large complex known as tubular myelin, which is responsible for reducing surface tension in alveoli. It has been recently understood that insulin inhibits this process, a fact that explains the increased incidence of lung disease (especially respiratory distress syndrome) in infants of diabetic mothers.

A revolution has occurred right before our eyes due to treatment of premature infants with surfactant. Multiple studies have demonstrated that surfactant therapy has decreased pulmonary interstitial emphysema, the incidence of pneumothoraces, bronchopulmonary dysplasia, as well as improved mortality. Not surprisingly, however, there has been little impact of surfactant therapy on the incidence of patent ductus arteriosus, intraventricular hemorrhages, retinopathy of prematurity or necrotizing enterocolitis.

The years of basic research aimed at understanding surfactant have finally paid off with the advent of surfactant therapy, and it now appears that, whereas in the past respiratory disease was the leading cause of morbidity and mortality in neonatal intensive care, the focus in the 1990s will shift toward the infectious and neuroresuscitative complications of prematurity.

By term, the conducting airways are virtually entirely formed. In contrast, at birth there are only approximately 50 million alveoli, which by 1 1/2 years of age have increased to 300 million. Thus, the gas exchange surface is largely formed within the first two years of life. It appears that alveolar type II cells play an important role in this formation. Elastin formation also is pivotally involved in this first year of life. Failure of either of these systems alters the gas exchange system for life.

Many of our therapeutic interventions can alter the formation of alveoli within the first year and a half of life; for example, low-oxygen tension stimulates lung development and growth, whereas hyperoxia may tend to inhibit it. Steroids also seem to inhibit this proliferation of gas exchange surface area; however, they seem to facilitate surfactant production. Clearly, there is a complex interplay between these factors and the ultimate effect, and indications for steroids in neonatal lung disease are yet to be further understood.

It also has become clear that stretch and movement stimulate lung growth. In utero, impingement on the intrathoracic space, such as occurs with congenital diaphragmatic hernia (CDH), and decreased respiratory movements greatly hamper pulmonary development and lead to the contralateral pulmonary hypoplasia, which is an invariable accompaniment of CDH. Over the last few years, it has become increasingly apparent that what was previously thought to be inert connective tissue (elastin and collagen substructure of the lungs) plays an important part in growth and repair.

Following their morning presentations, (from left to right) Robert K. Crone, M.D., Etsuro Motoyama, M.D., David Nichols, M.D., Victor Chernick, M.D., Bradley Thatch, M.D. and Martin Joyce-Brady, M.D. responded in a manner reflected in the relaxed atmosphere that pervaded the 1990 SPA Annual Meeting.

Many factors may alter connective tissue structure. These include infection, inflammation, mechanical ventilation and oxygen tension that may have significant impact on early neonatal lung development. This may have lifelong implications by altering pulmonary structure in an irreparable fashion.

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Victor Chernick, M.D., Professor of Pediatrics of the University of Manitoba, Winnipeg, Canada, followed with a lively discussion of apnea and the control of breathing in infancy and childhood. Dr. Chernick introduced his speech with a conversation about the Canadian Health System, and he concluded with the statement that "politicians make you gasp." However, he did not seem to think the Canadian politicians had been particularly beneficial for the health of neonates.

The complex subject of control of breathing was rationally approached by Dr. Chernick, who organized the confusion of premature apnea, postanesthetic apnea and airway obstructions and apnea from adenotonsil hypertrophy into an understandable structure. There are multiple, complex developmental changes throughout gestation, the understanding of which has clarified our management of neonatal problems. These include the fact that indomethacin alters fetal breathing patterns, and prostaglandin E_2 also appears to depress fetal breathing. This has shed new light onto the eicosanoid modulation of the regulation of respiration. In addition, glucose in utero clearly stimulates neonatal breathing, and the levels of glucose in utero may play an important postnatal role in the development of apneas.

Dr. Chernick detailed the apparently paradoxical hypoxic response in the newborn and revealed evidence that this was clearly due to a central chemoreceptor failure, which was oxygen-dependent. In addition, of interest was the depression of the CO_2 response curve with hypoxia, which can be reversed with naloxone in the neonate. Dr. Chernick lent some support to the notion that neonatal apneas, SIDS and postanesthetic apnea may be related to deranged central endogenous opioid processes. Nevertheless, he was cautious to point out that this clearly is not the whole picture.

In older children, the syndrome of adeno-

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tonsilar hypertrophy, frequently combined with an element of central respiratory depression and an apparent immaturity of neural connections, was discussed. A history of enuresis, nocturnal sweats, snoring and respiratory pauses, as well as hyperactivity, repeated pneumonias and failure to thrive may all be attributable to chronic upper airway obstruction. When left untreated, cor pulmonale with pulmonary hypertension and hypoxemia develop in a few cases. This syndrome has become increasingly recognized.

In the discussion that followed this talk, it was clear the postoperative management of these children presents a dilemma. Dr. Chernick presented data that demonstrated abnormal central ventilatory function in these children, which could be expected to persist postoperatively, suggesting the need for postoperative monitoring for apnea and hypoxemia.

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The third talk of the morning was presented by **Bradley T. Thatch, M.D.,** a neonatologist from St. Louis Children's Hospital and Professor of Pediatrics at Washington University School of Medicine. Dr. Thatch's discussion of upper airway function in infants and children, with specific reference to laryngeal function, was of particular interest to the practicing anesthesiologist. The implications in helping us to understand laryngospasm were obvious. Dr. Thatch clearly outlined three neuromuscular mechanisms that are important in regulating upper airway patency.

The first of these is laryngeal closure, which prevents expiratory air flow during a Valsalva maneuver. Dr. Thatch demonstrated that young infants frequently have vigorous motor activity. They invariably perform a Valsalva maneuver when painfully stimulated or distressed. Apneic episodes associated with irregular squirming motor activity in preterm infants, breath-holding apneic episodes in older infants and breath-holding attacks in older children are all manifestations of this response. These clearly result in marked reduction in ventilation. In certain infants, prolonged severe hypoxia and loss of consciousness also may occur. This sort of episode may underlie some of the episodes of laryngospasm in the operating room.

The second neuromuscular function is pharyngeal airway tone during inspiration. Pharyngeal airway patency is determined by a balance of dilating and constricting muscular forces in the airway (see Figure 1). The constrictors include a Bernoulli effect during inspiration and airway compression by alternations in neck flexion. The dilators are produced by phasic and tonic contraction of upper airway muscles, such as the genioglossus, sternohyoid and geniohyoid. These are modulated by pressure sensitive responses, lung stretch receptor reflexes, chemoreceptor reflexes and CNS arousal mechanisms. Inhibition of these mechanisms with failure of airway stiffening may be the basis of obstructive and mixed sleep apneas. Clearly, these would be worsened when associated with anatomic upper airway narrowing, such as choanal atresia, micrognathia, adenotonsilar hypertrophy and obesity. The impact of general anesthetics on airway patency may be due to loss of this constrictor tone.

The third mechanism that Dr. Thatch outlined is the laryngeal chemoreflex. The larynx is intensely innervated. The intra-arytenoid area is particularly sensitive to tactile stimuli, especially liquids, and to changes in pH and osmolarity. These stimuli give rise to a wide spectrum of responses, which include obstructed inspiratory efforts, coughing, swallowing, arousal and apnea. Clearly, these reflexes are airway protective, preventing aspiration; however, in children with gastroesophageal reflux and regurgitation, they may lead to episodes of apnea. In addition, this sort of reflex almost certainly underlies laryngospasm during anesthesia. RSV and potentially other upper respiratory tract infections enhance the sensitivity of these chemoreceptors, as do anesthetics by a so-far undisclosed mechanism. This combination explains the increased incidence of laryngospasm in children with viral upper respiratory infections.

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Following an active coffee break, **David G. Nichols, M.D.,** Director of the Pediatric Intensive Care Unit at The Johns Hopkins Hospital, Baltimore, presented an overview on respiratory muscle function in infants and children illustrated with his extensive research data. In his model, he drew an analogy to the Starling mechanisms of myocardial function. The four parameters that determine the contractile force of diaphragmatic function are: 1) fiber length (preload), 2) imposed load (afterload), 3) intrinsic contractile properties of the diaphragm (inotropic characteristics) and 4) the respiratory rate.

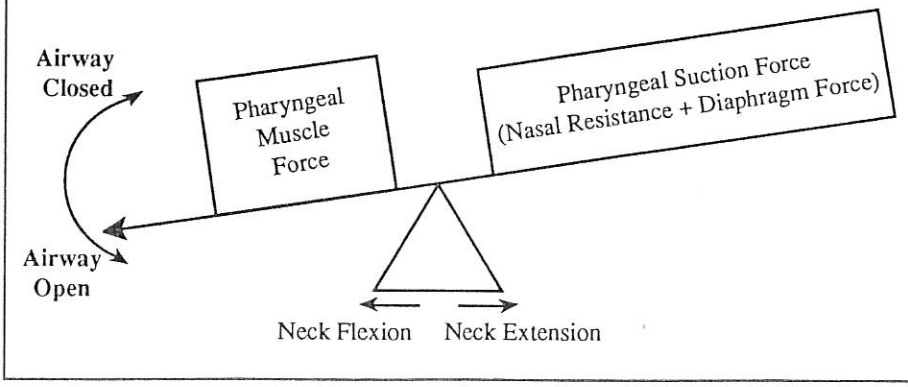
The configuration of the diaphragm with varying fiber lengths, the thoracic configuration and the load imposed by abdominal muscles alter force output from the diaphragm. Contraction initiating from shorter resting lengths may be less efficacious. For example, in childhood diseases such as asthma, the diaphragm may be placed at a mechanical disadvantage due to hyperinflation.

Afterload on the diaphragm is related to both airway resistance and lung compliance. It appears that the infant's diaphragm is less capable of maintaining tidal volume when challenged with an inspiratory load; thus, this partially explains the markedly increased respiratory rates in children with pulmonary disease. From some of Dr. Nichol's work, it appears that the infant diaphragm is less able to increase energy consumption when loaded. The diaphragmatic muscle clearly shows developmental differences. The premature infant has predominantly slowly contracting (type II C) fibers that are poorly organized, whereas

(Figure 1)

Pharyngeal Airway Patency:

A balance of dilating and constricting muscular forces in the airway.



Myron Yaster, M.D., in characteristic fashion, led the assault from the floor on our afternoon speakers.

with maturation, organization and fiber type changes in a fashion similar to the myocardium. These maturational changes are associated with an increased force output and contraction velocity with age.

The causes of diaphragmatic fatigue and their understanding have implications for the intraoperative and critical care management of children with impending respiratory failure. The causes of diaphragmatic failure appear to be related to an imbalance between energy supply and demand, intrinsic feedback inhibition by hydrogen ion and inorganic phosphate locally, and decreased neural activation of the diaphragm. Interestingly, these factors are synergistic in maintaining diaphragmatic function.

The clinical pathologic correlates of these underlying conditions are widely familiar. Hemodynamic compromise is frequently an underestimated cause of respiratory failure. Clearly, hypoperfusion of respiratory muscles will alter the energy supply-demand relationship and contribute to respiratory muscle fatigue. Metabolic disorders also may inhibit diaphragmatic function, such as hypomagnesemia, hypercapnia, hypophosphatemia and hypocalcemia. In addition, the neuro-innervation of the respiratory muscles may play a role in the development of sleep apneas in younger children. In newborn infants, chest wall retractions frequently occur especially during REM sleep. This alteration in neuro-innervation reflects the sensitivity of the infant's respiratory neuromuscular system.

The highly compliant infant's chest with chest wall distortion may greatly alter muscle energy demands. This also may partially explain the difficulty infants have in maintaining adequate spontaneous respiration while anesthetized. Anesthetics may alter the innervation of the respiratory muscles necessary for maintaining resting muscle tone; this then optimizes the mechanical forces, which in turn optimize respiratory muscle function. Under halothane anesthesia, chest wall distortion becomes much more likely.

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The morning session was brought to a spectacular conclusion in the usually eloquent style of **Etsuro K. Motoyama, M.D.,** senior attending anesthesiologist, Children's Hospital of Pittsburgh, and Professor and Vice-Chairman of Anesthesiology and Critical Care Medicine at the University of Pittsburgh. Dr. Motoyama discussed ventilation in infants and children. He gave a masterly review of the effects of anesthetics on the regulation of ventilation in children, touching on and integrating many areas that had been discussed in the morning. For example, he focused on the effects of sedation and inhalational anesthetics on the activity of genioglossus, interdigitating nicely with Dr. Thatch's conversations concerning pharyngeal muscle tone. He also reviewed the literature concerning the effects of inhalational anesthetics on the hypoxic ventilatory response, reminding us that even trace amounts of inhalational anesthetics obliterate hypoxic responses. Following the morning's excellent presentations, an active panel discussion took place.

The stimulating morning session was followed by a feast of magnificently Byzantine proportions. Clearly, the Society's officers are determined to pander continually to the fondest gastronomic desires of pediatric anesthesiologists. The spacious surroundings allowed much table-hopping, visiting and interactions between pediatric anesthesiologists from around the world, all in a cordial ambiance. It was just as well, for the afternoon proved to be a flurry of stimulating clinical issues.

Afternoon Session

Introduced by **Aubrey Maze, M.B.,** the afternoon session was kicked off by **Linda Jo Rice, M.D.,** Assistant Professor of Anesthesia and Pediatrics, Children's National Medical Center in Washington, D.C., who asked the question: "Ketamine - Does It Have a Place in Pediatric Anesthesia?"

"From 'star wars' to dinosaur in 20 years." It seems surprising to remember that ketamine was introduced merely 20 years ago; now it is such a staple of pediatric anesthesia, even considered somewhat passé by a few. Exactly what is its role in pediatrics? In her usual brisk and snappy manner, Dr. Rice reminded all of us that "ketamine is an easy, seductive drug." It appears to maintain oxygenation better with fewer apneas and less hemodynamic instability; however, despite this, patient monitoring must still be compulsive.

Using a preinduction dose of 2 mg/kg of ketamine, emergence phenomena and further complications are unlikely. It is particularly useful in the following situations: preinduction sedation; brief, painful medical procedures such as burn dressing changes; remote sedation when the airway may not be maintained (such as for radiation therapy); austere conditions such as mass casualties (e.g., limb removal prior to extrication from the trauma scene); and induction of anesthesia in the hypovolemic, hypotensive patient. Dr. Rice strongly stated that there is no alternative to ketamine that combines versatility, ease of use and multiple routes of administration. Dr. Rice concluded with the statement, "I consider it the American Express Card of pediatric anesthesia — I may not always use it, but I won't leave home without it!"

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Steven P. Serlin, M.D., attending anesthesiologist, Phoenix Children's Hospital, presented the next talk concerning single-dose epidural duramorph administration. "The ep-

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idural space is an anatomic interstate allowing ready and free access with quick rostral spread," Dr. Serlin stated. He contended quite convincingly that one dose perioperatively was sufficient to provide 10-24 analgesia in a very safe fashion. The doses of duramorph reported in the literature range from 20-160 mcg/kg. He pointed out that it could be given at any spinal level. His final recommendation was that 50-60 mcg/kg given in a volume of 1 ml/kg provides wonderful analgesia.

He presented information that in 416 cases, only one child who received 100 mcg/kg had evidence of significant CO_2 depression. Another case developed upper airway obstruction. This child had Prader-Willi syndrome. All patients were monitored for respiratory rate and with pulse oximetry and were checked hourly for somnolence. Dr. Serlin's final recommendations include monitoring with nursing education and an anesthesiologist's follow-up visit; however, regular pediatric floors are adequate and ICU admission is unnecessary. With this, patients appear to be comfortable, requiring little parenteral narcotic addition, and epidural catheter placement and management can be avoided.

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John J. Mulroy, M.D., attending anesthesiologist, Children's Hospital and Medical Center, and Assistant Professor of Anesthesia and Pediatrics, University of Washington School of Medicine, Seattle, presented a stimulating conversation on preanesthetic sedation. Many recent developments have impacted our use of premedication in pediatric anesthesia. Dr. Mulroy started by revealing the fact that he does not routinely premedicate patients. His criteria for an adequate premedication would be that it is readily acceptable to the child, efficacious, rapid in onset, safe and short-lasting. He pointed out that there were "multiple aficionados of each orifice."

Relentless pressure from insurance companies has caused us to do the majority of pediatric surgical cases as outpatients. This leaves us the task of reconciling patient safety and psychologic stress with efficient patient flow through our busy outpatient clinics. The agents he particularly focused on were oral transmucosal fentanyl citrate, pointing out that this still did not appear to be commercially available or evaluated in an outpatient setting, and midazolam. The latter certainly seems to be a commonly used agent; it can be given intranasally in 0.2-0.3 mg/kg with an onset time of about 10 minutes. Alternatively, 0.5 mg/kg can be given orally, and adequate sedation is achieved in 20-30 minutes. A rectal dose of 0.3 mg/kg has an onset time of 20-30 minutes as an anxiolytic agent.

Dr. Mulroy briefly discussed the use of propofol and its role in pediatrics. He noted the difficulty with the pain of injecting propofol, which may well outweigh any advantages from rapid recovery in outpatient anesthesia. The additional point that most children do not undergo IV induction of anesthesia suggests that the role of propofol in children is not yet clear.

The panel discussion that followed Dr. Mulroy's presentation was very energetic. From the discussion, it became clear that anesthesiologists are divided over the use of premedication. The overwhelming resistance is that onset given by any route other than by needle appears to be slow. In addition, coaxing children to take bitter-tasting medicines remains a problem. One suggestion was made from the floor: 5 mls Nutrasweet® Grape KoolAid® in a very concentrated solution, making only two cups from the usual packet, was quite efficacious in disguising the bitter taste of midazolam.

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The next item on the afternoon agenda was a duel between **Theodore W. Striker, M.D.,** Chief of Anesthesia at Children's Hospital and Medical Center in Cincinnati, and **Rosemary J. Orr, M.D.,** attending anesthesiologist, Children's Hospital and Medical Center, and Assistant Professor of Anesthesia and Pediatrics at the University of Washington School of Medicine, Seattle. The topic over which they drew swords was: "Controversies in Pediatric Anesthesia: Should All Adolescent Females be Pregnancy-Tested Prior to Anesthesia?"

Dr. Striker said he believes that all female children of child-bearing age should undergo pregnancy testing. He stated that the mating characteristics of the American adolescent were inscrutable to the average anesthesiologist, and that testing was mandatory to prevent the exposure of pregnant patients to unnecessary risk. The tidal wave of adolescent pregnancy — with 36 percent of all women becoming pregnant within two years of beginning intercourse, which occurs increasingly at a younger age and well into the pediatric age group — made testing, in Dr. Striker's opinion, *de rigueur*. Routine beta HCG testing in 18 months had turned up two patients previously not suspected of being pregnant, affecting the anesthetic decisions.

Dr. Orr initiated her spirited discussion by introducing philosophical concepts that included issues of privacy. It was her opinion that testing was of extremely low yield, that it took a great deal of time, and that the risk of anesthesia in undisclosed pregnancy was indeed very small. Dr. Orr made a call for an individualized and careful personal approach

Speakers (from left to right) Aubrey Maze, M.B., Linda Jo Rice, M.D., Steven Serlin, M.D. and John J. Mulroy, M.D. responded with wit and repartee to questions from the audience following their afternoon presentation.

that would take into consideration the understanding, knowledge and resources available in the developing field of adolescents. The discussion that followed also showed little consensus. The audience was equally divided between: "we test," "we don't test," "we don't care" and "we hadn't considered the issue."

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The watchword of the next presentation was foresight. **Charles J. Coté, M.D.,** Associate Professor of Anesthesia, Harvard Medical School, and associate anesthesiologist, Massachusetts General Hospital, Boston, discussed anesthesia outside the operating room. He stated that the hallmarks of careful, safe, anesthetic delivery are: 1) understanding the procedure, 2) being aware that one is in a hostile environment requiring thorough equipment checkout, 3) a preprocedure check of the geography, layout and location of the site, and 4) layout of the anesthesia equipment, positioning and distance from the patient need to be carefully considered in developing a safe and secure anesthetic plan from the beginning.

Dr. Coté's talk was quite exhaustive and full of practical tips as well as illustrations of life in a magnetic field. Although he highlighted the need for anesthetic monitoring that is as meticulous and cautious as in the OR setting, he pointed out that in several environments, notably during MRI, complete monitoring may be difficult. The radio frequencies accompanying MRI interfere with EKGs and pulse oximetry, and monitoring these parameters during the procedure may be quite difficult. Not only does the effect of the magnetic field on anesthetic monitoring need to be considered, but so does the anesthesia equipment's effect on the magnetic field. Anything that generates a radio frequency (i.e., anything that has electric current) perturbs the diagnostic magnetic field and interferes with image quality.

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After an invigorating break to revitalize the neurons, the afternoon session dealt with clinical respiratory problems and included a discussion of management of the patient with epiglottitis by **Charles H. Lockhart, M.D.,** Director of Anesthesiology, Children's Hospital of Denver, and Professor of Anesthesiology and Pediatrics, University of Colorado Health Sciences Center. Dr. Lockhart reviewed the literature and highlighted the controversies currently surrounding the management of epiglottitis. He also presented one interesting diagnostic pearl which arose from Mauro's study (*Am J Dis Child* 142:679, 1988). If the patient who has stridor has a spontaneous cough, he is unlikely to have epiglottitis. The drooling child with no spontaneous coughing has epiglottitis.

Dr. Lockhart very strongly emphasized that artificial airway management was required and, in his opinion, medical management and observation in children with epiglottitis was not acceptable. The method of choice was endotracheal intubation over tracheotomy, confirming years of practice. There was some discussion about whether children should be intubated awake versus anesthetized, and Dr. Lockhart favored anesthesia. He pointed out that induction would be very, very slow, and that ample time must be allowed for an inhalational induction. The addition of face mask continuous positive airway pressure may assist the maintainence of airway patency. Deep inhalational anesthesia must be obtained prior to intubation, and the pitfall of this is that hemodynamic compromise and bradycardia may occur. For this reason, it was mentioned during the discussion that atropine should accompany inhalational anesthesia for epiglottitis.

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The next paper concerned the technical questions dealing with capnography. **J. Michael Badgwell, M.D.,** Associate Professor of Anesthesia and Pediatrics, Texas Tech University Health Sciences Center, Lubbock, presented a "pony trek through capnography." In routine circle systems, either flow through capnography or aspirating capnography appears to be equally beneficial, yet they frequently underestimate arterial CO_2 in the presence of ventilation-perfusion mismatch or cardiac anomalies in children. With rebreathing circuits, fresh gas flow always dilutes end tidal gas and causes difficulty in estimating arterial CO_2. This effect is most marked in small infants. It is in these circuits that it is particularly important to monitor CO_2 because there is increasing evidence that the set formulae for fresh gas flows do not predict end tidal CO_2 values (*Can J Anaesth* 35:581, 1988). Dr. Badgwell strongly recommended routine monitoring and discussed familiarizing the anesthesiologist with the many options available.

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Mark A. Rockoff, M.D., Vice-Chairman and Clinical Director, Department of Anesthesia at Children's Hospital, Boston, and Associate Professor of Anesthesia and Pediatrics, Harvard University Medical School, began his presentation about anesthesia for Siamese twins by quipping, "Please don't take too seriously everything you hear from the Harvard faculty." Despite this opening comment, he presented a masterful and scholarly talk on this unique topic. He noted that the Bible presented the first recorded example of twins. He also mentioned that, for some reason, 70 percent of Siamese twins are female. In an educational and entertaining fashion, Dr. Rockoff reviewed the long history of surgical approaches to Siamese twins. His discussion reminded us of the crucial importance of anesthesia and critical care in the management of children with complex surgical problems.

Following this wonderfully rewarding day, a wine and cheese reception was well-attended by course participants. During this time, further discussion on the afternoon's topics continued into the early evening hours. Groups of pediatric anesthesiologists met up with friends and slowly ambled off to a well-deserved evening of relaxation as the sun set on a brilliant day in Las Vegas. ❑

ANNUAL MEETING SPONSORS

The Society for Pediatric Anesthesia (SPA) recognizes the SPA Annual Meeting sponsors and expresses its appreciation for their valuable contributions. This year's sponsors were:

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PEARLS AND PERILS

The purpose of **PEARLS AND PERILS** *is to allow communication by practitioners of pediatric anesthesiology of their clinical pearls, patient care nuggets and tips relevant to the art of pediatric anesthesiology. If you have anything that you would like to share with your colleagues, please mail it to Steve M. Audenaert, M.D., Director of Pediatric Anesthesia, University of Kentucky, Chandler Medical Center, Lexington, Kentucky 40536-0084. We will publish your contribution(s) on a space-available basis.*

The "Magical" Pediatric Anesthesia Preop

By J. Christian Abajian, M.D. and Steve M. Audenaert, M.D.

In this short column, we shall not delve into the importance of the preoperative visit or the advantages or disadvantages of using preop sedation for children. The literature abounds with both psychologic and pharmacologic data to support or reject various positions on the subject. Rather, we wish to emphasize an additional wrinkle that we believe can enhance your ability to win over the reluctant, fearful child and also the parents who frequently appear equally fearful. Eliminating or reducing fear on separation, both for the child and the parents, presents a real challenge for the anesthesiologist. Here are practical, time-proven suggestions that often change an unpleasant, difficult interaction into a rewarding experience for *all* parties.

The key word in our title is "Magical." We would like to share our experience with the use of magic to establish a doctor-patient relationship that will not only facilitate the current anesthetic experience but will endure for future visits as well.

Magicians have enchanted audiences of all ages for centuries. While young children frequently have short attention spans, a magician at a birthday party, using the appropriate illusions, can easily captivate and hold the attention of 3- or 4-year-olds for 15 minutes or more. Children in the hospital environment likewise can be distracted, fascinated and often enchanted by similar feats.

Many of the tricks performed by professional magicians require hours of practice and demand a sophisticated level of manual dexterity. However, there are a variety of inexpensive tricks and illusions that require very little practice and no special sleight-of-hand ability. Described here are several such tricks that can be easily carried on one's person or stored in an anesthesia machine drawer. We have given the common name for the trick and designated the ages most appropriate for effective use. In addition, there are dozens of tricks to be performed with props no more involved than some string or pocket change. If your city does not have a magic store, we have listed several mail-order businesses.

FUN MAGIC COLORING BOOK (ages 3 - 10)

The illusion created by this trick is that by rubbing a child's hand on the cover of the book, all the pictures inside become colored. A second wave over the book makes all the pages totally blank, and a third wave over the book restores the uncolored pictures. The crying child may refuse to touch the book, yet when he or she observes what the parent does with the wave of a hand, tears almost instantly stop and a small hand reaches out to repeat the magic. You need this book! It's cheaper than any anesthesia text on the market, and in 60 seconds you can be performing this amazing illusion!

THUMB TIP TRICK (ages 4 to adult)

While many different routines exist for the prop known as the "thumb tip," the easiest is to make a silk handkerchief appear and disappear from a "magic" blanket, sheet or even an OR towel. This inexpensive trick easily fits into the smallest of pockets. (Ours frequently get sent to the laundry so we keep several on hand!) The trick can be repeated over and over with little chance of anyone seeing how it is performed.

SCOTCH AND SODA COIN TRICK (ages 7 to adult)

This is a slightly more expensive trick (upwards of $20), but money well spent. Two coins, usually a Kennedy half dollar and an English penny, are placed into the patient's hand. Both hands are placed under a "magic" blanket or behind one's back. When asked to give back the English penny, the smaller of two coins, the patient opens a hand only to find a 25-cent piece. The English penny is subsequently found in your pocket! Mind-boggling! It being impossible for the patient to give back the English penny, one can easily extract a promise of good behavior for failing to do so.

While good magicians never reveal how their tricks are performed, we frequently promise another trick in the recovery room in exchange for cooperation in the OR. These tricks do not delay surgery. They often take less than a minute to perform and can be done during the preop visit, in the preop hold area or even with the patient sitting on the OR table.

In 20 years of combined pediatric anesthesia experience, we cannot think of anything that so swiftly and effectively establishes a doctor-patient relationship. Children in the hospital will request another trick in the hallway or even volunteer to return to the OR for the treat of another performance. Parents outside the hospital frequently tell how their child still talks about the "magic man" at the hospital. One warning, however: although two or three tricks are adequate for most needs, magic is addictive.

Local magicians are often willing and excited to instruct the neophyte when told how these tricks will be used. Look for "Magicians" in the *Yellow Pages*, and you may get some "magical" help. Easier still, go to your local magic store. The owners are, almost without exception, magicians themselves. Spending an hour there is entertainment in itself! You are sure to leave with a smile on your face and a new toy in your pocket. And, you never know who you will meet. The authors, in fact, first met each other in a magic shop. Try it. Then, please let us hear about your experiences.

SOURCES:

Magic Master, Inc., 3044 Miller Road, Lithonia, Georgia 30038; (404) 808-7000.

Magic, Inc., 5082 North Lincoln Avenue, Chicago, Illinois 60625; (312) 334-2855.

Hank Lee's Magic Factory, P.O. Box 789, Medford, Massachusetts 02155; (800) 874-7400 or (617) 482-8749.

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LITERATURE REVIEW

By James P. Viney, M.D., Robert M. Spear, M.D., and Randall C. Wetzel, M.D.

The following literature reviews have been selected from recent issues of international journals concerning pediatric and surgical studies which may be of interest to the pediatric anesthesiologist.

Oral transmucosal fentanyl citrate for premedication in paediatric outpatients
Ashburn MA et al. *Can J Anaesth* 37:857-866, 1990.

In this lengthy article, the authors present the results of oral transmucosal fentanyl citrate (OTFC) premedication in pediatric outpatients. Thirty-six children received 10-15 mcg/kg, 34 received 15-20 mcg/kg, and 35 received placebo. They required from 2-50 minutes to consume their OTFCs or placebo units. Sixty to 89 percent of the OTFC children had decreased activity with drowsiness within 40 minutes. A placebo effect was noticeable in 30 percent of the children within 20 minutes. Apprehensiveness was decreased in the second group within 40 minutes. Of note was that respiratory rate and oxygen saturation were decreased in the OTFC groups. Postoperatively, puritis was common, but nausea and vomiting only occurred in the fentanyl groups. The authors conclude that OTFC is an efficient premedicant.

Comment: These authors are very familiar to us as there have now been numerous studies on the efficacy of OTFC. The ability of OTFC to produce sedation at the cost of decreased respiratory rate, decreased saturation, albeit not serious, puritis, nausea and vomiting is well demonstrated. One wonders what is delaying the general release of this agent. For some time, we have heard about this novel formulation. Is the adverse publicity from "Nader's raiders" responsible for lack of FDA approval? Are there unacceptable problems such as narcotic control issues holding up release? Is there a market? Where will this form of premedication fit into our busy pediatric anesthesia services? Drowsy children who have itchy faces and rub their eyes can be produced in a number of ways, but do they accept the mask or the IV? When will we be allowed to assess this approach for ourselves? - *RCW*

Pharmacokinetics of propofol in children
Jones RDM, Chan K, Andrew LJ. *Br Anaesth* 65:661-667, 1990.

These doctors from the university of Hong Kong studied the pharmacokinetics of propofol in 12 children undergoing circumcision. They found propofol pharmacokinetics to fit a three-compartment model, similar to adult studies. The mean awakening time (30 minutes) reflects the effects of the premedicant and halothane. They also used EMLA (lidocaine and prilocaine) for IV insertion, intravenous procaine to prevent discomfort during propofol administration and bupivacaine (penile and/or caudal block) for postoperative analgesia.

Comment: Serum samples from these patients would be suitable for the final exam in Advanced Liquid Chromatography 301. - *RMS*

Comparison of propofol and thiopental/halothane for short-duration ENT surgical procedures in children
Borgeat A et al. *Anesth and Analgesia* 71:511-515, 1990.

This study from Switzerland compares 20 children who received propofol, nitrous oxide anesthesia, compared to 20 who received thiopental/halothane, nitrous oxide traditional anesthesia for adenotonsillectomy. The propofol children received 3 mg/kg loading dose with a continuous infusion of 0.1 mg/kg/min. All patients received vercuronium for muscle relaxation and endotracheal tubes were placed in all patients. The mean time of surgery was 35 minutes in the thiopental group and 37 minutes in the propofol group. The results are quite interesting. Following discontinuation of the anesthetic, the propofol group was extubated in 4.4 ± 0.74 minutes, while the thiopental/halothane group was extubated in 13.5 ± 2.3 minutes after discontinuing anesthesia. The time to discharge from the recovery room following discontinuation of the anesthetic was 7.22 ± 0.59 minutes in propofol group and 30.4 ± 4.03 minutes in the thiopental group. One very interesting finding was that none of the propofol children required supplemental analgesia, whereas nausea, vomiting and analgesia requirement were greater in the thiopental/halothane group.

Comment: This study is quite interesting. Although the usual problems with propofol, pain on injection and the need for IV administration in these 5- and 6-year-old children, make this study somewhat difficult to duplicate in this country, I am finally impressed with the potential for propofol in pediatrics. A very rapid recovery, combined with the addition of analgesia and the notable smoothness of emergence seen in the propofol group, may well provide a significant and worthwhile advantage in children's anesthesia. That the discharge criteria were met by eight minutes after discontinuing the drug is of remarkable interest. Although we would be unable to take advantage of this rapid recovery in our hospital (we can hardly get our patients signed into the recovery room in such a short period of time), the fact that these patients have recovered so quickly without evidence of nausea, vomiting or pain at least warrants our attention. - *RCW*

A complication associated with dorsal penile nerve block
Berens R, Pontus SP. *Reg Anesth* 15:309-310, 1990.

This case report describes the inadvertent use of epinephrine 1:1000 instead of lidocaine for a dorsal penile nerve block (DPNB) in a 2-day-old boy. The infant was described as tremulous and hyperexcitable,the penile shaft was pallid, and the glans penis dark purple and nonblanching. A caudal epidural injection was performed (1 percent lidocaine) to induce partial sympathectomy and resulted in improved perfusion to the penile shaft and glans penis.

Comment: Despite the use of the worst drug in the most concentrated form, no permanent sequelae resulted. Careful reading of a previous report describing complications of DPNB (Sara and Lowry, *Anaesthesia Intens Care* 13:79-85, 1984) suggests to me that the surgical procedure was as suspect as the DPNB. When properly performed, DPNB remains a useful and safe procedure. Nevertheless, our pediatric colleagues are taught otherwise. The American Academy of Pediatrics Task Force on Circumcision (*Pediatrics* 84:388-391, 1989) recently stated, "It would be prudent to obtain more data from large controlled series before advocating local anesthesia as an integral part of newborn circumcision." - *RMS*

Complications of nasotracheal intubation in neonates, infants and children: A review of 4 years in a children's hospital
Black AE, Hatch DJ, Nauth-Miser N. *Br Anaesth* 65:461-467, 1990.

These authors from Great Ormond Street used a computerized database to prospectively

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LITERATURE REVIEW

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study the incidence of complications emanating from 2,953 nasotracheal intubations in children. The majority were small children (56 percent <1 yr, 80 percent <5 yr). Twenty percent were intubated for more than seven days.

Complications were seen in 239 cases, an overall complication rate of 8 percent. No complications were fatal, caused cardiac arrest or resulted in serious sequelae. The most common complications were accidental extubation and tube blockage, usually necessitating reintubation. Eighty percent of accidental extubations occurred in infants less than 1 year, and 80 percent of tube blockages occurred in tubes with an internal diameter of 3.5 mm or less. Postextubation stridor was seen in 44 children; 21 required reintubation with none developing symptomatic subglottic stenosis.

The authors attribute the absence of hypoxic sequelae to their practice of avoiding muscle relaxants and the absence of significant subglottic stenosis to ensuring the presence of a leak around the tube at an airway pressure of 25 cm H_2O. They conclude that "long-term tracheal intubation can be managed with an acceptably low incidence of complications, and that tracheotomy has virtually no role in patients without pre-existing upper airway pathology for the first 3-6 weeks." - *RMS*

Critical volume for pulmonary acid aspiration: Reappraisal in a primate model

Raidoo et al. *Br Anaesth* 65(2):248-250, 1990.

These investigators from the Natal looked at the volume of gastric contents (with a pH adjusted to 1 by adding hydrochloric acid) necessary to cause pulmonary injury. A total volume of 0.4, 0.6, 0.8 or 1.0 ml/kg was directly instilled into anesthetized monkeys via the endotracheal tube; then, the animal was ventilated to promote widespread distribution. There were no deaths in the 0.4 or 0.6 ml/kg groups, 1/6 died with 0.8 ml/kg, and 50 percent died in the 1.0 ml/kg group.

Comment: When interpreting this study for the clinical risk of aspiration, we need to remember the investigators added acid to the gastric contents to lower it to a pH 1 and that all the contents were directly instilled into the trachea, something that may not happen if someone vomits and is treated by change of position and suctioning of the oralpharynx. - *JPV*

Symposium Report: The stomach; factors of importance to the anaesthetist

Review by the Canadian Anaesthesia Association. *Can J.Anesth* 37: 896-906, 1990.

The Canadian consensus panel, of which this is a report, has recommended modification of the Canadian Anaesthetists' Society guidelines. The concluding paragraph of this paper reads: "The fact that an empty stomach can never be guaranteed is reflected in the cautious, nondogmatic revision of CAS guidelines proposed in 1990. These state: 'Recognizing that there is currently no fixed period of fasting recommended before all procedures, departments must establish policies concerning patients' oral intake before elective induction of anaesthesia.' These policies should vary to take account of age and pre-existing medical conditions, and should apply to all forms of anaesthesia. Nonelective procedures should be undertaken after considering the risks of delaying surgery with the risk of aspiration of gastric contents." There is no support for any NPO status of less than two hours of duration. Clear liquids may be given ad lib up until this time. No solid food for eight hours prior to surgery seems to be the acceptable minimum.

Comment: This article should be read by all practicing anesthesiologists. With the large number of articles challenging conventional NPO guidelines, we all must be familiar with the data. This article nicely reviews much of the literature available. In our hospital, we already have been challenged by pediatric residents informing us that patients needn't be NPO anymore, quoting our articles. We imagine that this will only get worse. We all must be well armed with information and data to protect our patients from these naive assaults.

My concern is that a liberal clear liquids policy will be eroded in two directions: 1) clear liquids will turn into hamburger and fries; and 2) healthy patients will turn into patients who are in pain, apprehensive, receiving narcotics, pregnant, with gastrointestinal disorders, or who are on other medications. The pressure is on us all to liberalize our NPO policies due to concerns of patient comfort. In this case, the pediatric anesthesiologist has the responsibility to attempt to minimize the confusion that always accompanies change. - *RCW*

Total spinal anesthesia after caudal anesthesia in an infant

Desparmet J. *Anesth and Analgesia* 70:665-667, 1990.

Dr. Desparmet presents a case of an ex-premature infant given a caudal anesthetic after three unsuccessful attempts at a spinal. The infant developed a total spinal and was successfully resuscitated with CPR, atropine and volume. The spinal wore off in about two hours. Dr. Desparmet proposes a mechanism of either leakage of anesthetic through dural punctures in the unsuccessful attempts at a spinal or a dural puncture due to a low-lying dural sac. This report points out that the potential for problems exists with any anesthetic technique. - *JPV*

Liquid ventilation of human preterm infants

Greenspan et al. *J Pediatr* 117(1):106-111, 1990.

Accompanying editorial

Fuhrman 117:73-74.

It is unusual to see something totally different from conventional therapy roll down the pike. This article reports the use of liquid perfluorochemical ventilation (instillation?) to achieve oxygen transport in three preterm infants felt to be in a terminal state. After two short trials of gravity flow liquid ventilation, two of the three infants showed some improvement in arterial oxygenation, which the authors interpreted as possible improvement in surface tension within the lung (all infants had some improvement in respiratory compliance) by a liquid with excellent gas solubility properties. The improvement lasted more than one hour in two of the infants. It seems likely we will see more work along this line in the future. - *JPV*

Brief airway obstructions during sleep in infants with breath-holding spells

Kahn et al. *J Pediatr* 117(2):188-193, 1990.

These Belgian investigators examined airway obstruction and sleep patterns in 34 infants with breath-holding without loss of consciousness, 37 breath-holders with loss of consciousness and 71 control infants. The breath-holders were sweatier, had more fragmented sleep patterns and were more likely to evidence airway obstructive episodes during sleep (41/71) as opposed to the control group (6/71). Episodes of central apnea were no different between groups. They were unable to identify a known cause for airway obstruction on physical exam. The authors postulated an autonomic nervous system immaturity favoring airway obstruction.

Comment: Having known an infant who needed CPR to be revived from his "breath-holding tantrums" and who could not repro-

duce his tantrums when premedicated with atropine, I found this article of interest. Of more frequent importance is the documentation of obstructive episodes during sleep in many of the children who "breath-hold" while awake. The accompanying editorial (117:245-247) by Dr. Hunt points out some of the difficulties in classification of the variety of disorders of cardiorespiratory control in children. - *JPV*

Postoperative apnea in former preterm infants: prospective comparison of spinal and general anesthesia

Welborn, Rice, Hannallah, Broadman, Ruttiman and Fink. *Anesthesiology* 72(5): 838-842, 1990.

These investigators at the National Children's Hospital randomly looked at 36 ex-preterm infants, all less than 51 weeks post-conceptual age, none with pre-existing cardiac, neurologic or metabolic disease and not receiving theophylline or caffeine. Group 1 received halothane, N2O and O2, plus neuromuscular blockade reversed at the end of the case. Group 2 received spinal anesthesia with 1 percent tetracaine 0.4-0.6 mg/kg with equal volume of 10 percent dextrose and 0.02 ml epinephrine 1:1000. Group 2a received 1-2 mg/kg IM ketamine for sedation. Group 2b received peach Schnapps on a nipple (certainly one of my favorite methods of sedation). Postop pain was treated with acetominophen. No operation took longer than 55 minutes. Group 1 had 16 patients, 2a had 9, and 2b had 11. Thirty-one percent had prolonged apnea with bradycardia, and 89 percent of group 2a had this occur. None of group 2b had prolonged apnea and bradycardia. All episodes were detected by alarms and not by clinical observation. If the infants without a prior history of apnea were separated out, the differences were not statistically significant.

Comment: It appears that using ketamine in conjunction with spinal anesthesia in this group of patients may not be a good idea, and postoperative monitoring with electronic monitors and not just clinical observation is prudent. - *JPV*

Life-threatening apnea following spinal anesthesia in former premature infants

Cox and Goresky. *Anesthesiology* 73(2):345-347, 1990.

Drs. Cox and Goresky report that two ex-prematures who received spinal anesthesia had apneic episodes postoperatively. Both were receiving theophylline preoperatively, one with plans to discontinue it postop. They both received codeine orally for pain relief; however, the second patient's apneic episodes started 20 hours after the first codeine dose. That child probably had a urine infection that may have triggered his apnea. In the first case, the child had had mild apneic events preop but needed intubation postoperatively for severe events. Codeine may have played a role in this case; however, the child did not improve with naloxone. Such cases point out how fragile these children are. - *JPV*

How do our pediatric colleagues evaluate the patient who has what is now called an apparent life-threatening event. This is the preferred term to near-miss SIDS, since most children who have SIDS do not have prior ALTE. If you have had an infant who demonstrates de novo unusual respiratory control intraoperatively or postoperatively, how will your consultant work up this infant? What further risk might the infant be exposed to, and should the parents be monitoring the infant at home? This will be viewed differently according to which consultant you approach. If you are interested in looking into this muddy area, the following three articles will give you a handle on it, but they certainly are not the only viewpoints.

Are there tests predictive for prolonged apnoea and SIDS? A review of epidemiological and functional studies

Bentele and Albani. *Acta Paediatrica Scand Supplement* 342:2-21, 1988.

Management of an infant with an apparent life-threatening event

Kahn et al. *Pediatrician* 15:204-211, 1988.

Role of apnea in the sudden infant death syndrome: A personal view

Southall. *Pediatrics 80:73-84, 1988.* - *JPV*

Percutaneous axillary artery catheterization in critically ill infants and children

Greenwald et al. *Pediatr* 117(3):442-444, 1990.

The authors looked at 66 patients in a PICU who had a total of 100 axillary catheters placed. The catheters were placed predominantly because of poor access at other sites. The overall complication rate was 6 percent. Two patients had catheters removed on appearance of new seizures; however, they both had normal CT scans. Three patients had cold, blanched hands that returned to normal on removal of the catheter. Two patients had axillary hematomas that stabilized with removal of the catheter. One patient had ischemic necrosis of both hands symmetrically during his episode of septic shock. He appears to be the only patient with a long-term sequella of the catheter and, from their report, it was related to his disease and not his catheter. They recommend using a short catheter and a syringe pump, not a flush bag, to decrease giving flushes to the cerebral circulation - *JPV*

What constitutes adequate anesthesia in animals? In neonates?

Weinger and Koob. *Anesthesiology* 72(4):767, 1990.

Accompanying reply

Yaster and Koehler. 72(4):768, 1990.

These two letters present some of the issues involved in defining what is appropriate anesthesia for neonates: consciousness, lack of movement, analgesia and hemodynamic stability to which might be added endocrine responses.

Comment: Our older patients can usually tell us if they have remembered something, but our neonatal patients can only indicate by hemodynamic changes or movement (I am not, however, a proponent of narcotized, non-paralyzed neonates as an anesthetic technique). What are appropriate end points, and what animal models are appropriate to investigate them? Personally, I can remember one patient, an IV drug abuser, able to still open his eyes at 100 mcg/kg of fentanyl and even shut his eyes and failed to respond hemodynamically to intubation at 150 mcg/kg. Thus, humans may be different from lambs that Dr. Yaster tells us had open eyes and chewed on their endotracheal tubes at high doses of opioids. This issue is not easily decided when one of the components of the "anesthetic state" cannot be ascertained in nonverbal patients, and it is not clear what the presence of consciousness with analgesia implies for these patients. - *JPV*

General anesthesia prior to treatment of anterior mediastinal masses in pediatric cancer patients

Ferrari and Bedford. *Anesthesiology* 72(6):991-995, 1990.

Drs. Ferrari and Bedford report on 44 pediatric patients with anterior mediastinal tumors who received general anesthesia for tumor diagnosis prior to receiving any radiation therapy. Nine patients were symptomatic prior to surgery with a variety of different

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cough, superior vena cava syndrome, supine dyspnea, decreased breath sounds, wheezing, stridor and retractions. All patients received anticholinergics. Asymptomatic patients received pentothal and succhinylcholine if ventilation was easy; otherwise, they had an inhalation induction. Those with respiratory symptoms or compromise had IV access in the lower extremities. They had induction in a sitting position or semifowler position. If less than 6 years old, they received IV ketamine; if older, they received a halothane oxygen induction.

If ventilation was possible, then they were paralyzed; if not, spontaneous ventilation was maintained and intubation performed under halothane. A rigid bronchoscope was in the room for the surgeons to use if total airway compression occurred. None of the patients died or had severe sequellae; however, several patients had cardiorespiratory compromise. Two patients could be ventilated by mask prior to paralysis but had total airway obstruction after receiving relaxants, and only after rigid bronchoscopy with mainstem intubation could the airway be re-established. They were symptomatic prior to surgery. Two patients who did not receive relaxants could not be ventilated with controlled ventilation and did not tolerate position changes. One patient needed the sitting position, and the other did not tolerate turning the head. They both maintained ventilation spontaneously. Three patients needed to be left intubated postoperatively, one of whom was asymptomatic preoperatively and developed airway obstruction during induction. One patient needed reintubation in the recovery room 30 minutes postop for total airway obstruction. They recommend preserving spontaneous ventilation if possible, IV access in lower extremities, induction in the sitting position, being prepared to change the patients' position, and the presence of a rigid bronchoscope and skilled bronchoscopist.

These authors feel that the risks of anesthesia, although considerable, are less than failure to adequately make a tissue diagnosis. Others of our colleagues who have more unfortunate experiences with these very high-risk patients may believe otherwise. The decision to proceed with general anesthesia is certainly one that requires extensive discussion between the medical staff caring for the patient and the patient's family. - *JPV*

Minimizing the risk of brain herniation during treatment of diabetic ketoacidemia: A retrospective and prospective study
Harris et al. *J Pediatr* 117(1):22-31, 1990.

This article looks retrospectively at 219 episodes and prospectively at 58 episodes of ketoacidemia. Nine percent of the retrospective group were complicated by headache, deterioration of neural or vital signs or death. These episodes were significantly associated with a decrease in serum osmolality and a negative trend in serum sodium. The prospective study used a 48-hour rehydration scheme with 10 ml/kg of NS to treat shock as necessary, followed by rehydration fluid having an average of 125 meq Na+/L and a constant infusion of insulin, usually 0.1 U/Kg/hr. Glucose and sodium were monitored as frequently as one to two hours initially decreasing to every six hours as the patient stabilized. Only two patients had headaches; there were no other CNS complications. The authors suggest that a slower rehydration scheme and using more sodium may be of benefit in avoiding CNS catastrophes in DKA. Most certainly frequent lab determinations of glucose, sodium, osmolality, pH are important, and a falling sodium and osmolality are of great concern. - *JPV* □