Pediatric Endotracheal Tubes Revisited

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In March of 1953, Dr. Robert M. Smith (then chairman of the pediatric anesthesiology department at Children's Hospital Boston) published an article calling for improved intubation techniques to minimize the then high incidence of laryngeal irritation and tracheal edema following general endotracheal anesthesia in children.[1] This comparatively high incidence of morbidity and mortality in the pediatric population led to a general polarization among practitioners in the early 1950's. One group adopted the viewpoint that general endotracheal anesthesia should be avoided in the pediatric population. The second group felt that tracheitis was an unfortunate but unavoidable complication of pediatric endotracheal anesthesia which should not preclude its general use.[1] Using an admonition set forth by Gilles in 1951 that endotracheal anesthesia was too valuable a method to be jeopardized by abuse[2], Smith made a plea to refine the methods of pediatric endotracheal anesthesia and incorporate special precautions that would eliminate those errors that might lead to the development of tracheal irritation.

In general, otorhinolaryngologists were opposed to pediatric endotracheal anesthesia (except in a limited number of circumstances) while anesthesiologists favored the technique. Dr. Shirley Harold Baron (Division of Otolaryngology, Stanford University Medical School) opposed pediatric endotracheal anesthesia. While grudgingly admitting the merits of endotracheal anesthesia, he emphasized the disadvantages of the technique, especially in children, believing that both surgeons and anesthesiologists were dangerously cavalier and complacent in employment of this technique. In a presentation before the 1950 meeting of the American Laryngological, Rhinological and Otological Society, Baron quoted the following statement made by Dr. Moss in 1930: "Ploughing up the pharynx with a laryngoscope in an attempt to dig out an epiglottis from a pool of blood and mucus is one of the least inspiring sights of modern anesthesia."[3] Baron later wrote, "It is difficult for us to understand why, in children, endotracheal anesthesia should be used for an adeno-tonsillectomy in any instance. Anesthetists have argued that they protect the patient's airway from the blood overflow that occurs in the hands of certain surgeons. This may be so in some instances but it does not seem reasonable that an endotracheal tube should be used as a substitute for good surgery."[4] While Baron conceded that certain institutions appear to have limited complications, he warned his fellow ORL surgeons to be guided by the facts of their own experiences and not be misled by "favorable statistics."

In attempting to save a technique that he thought vital to the advancement of pediatric anesthesia, Smith called on practitioners to modify their intubation equipment and techniques to minimize mechanical force trauma, chemical irritation, and contamination. Large, heavy laryngoscopes with too short or too wide blades and endotracheal tubes of excessive caliber invited "ploughing" of the pharynx and stretching or tearing of the vocal cords. He recommended using a long, narrow blade. He also emphasized the need for proper intubating conditions through a combination of adequate relaxation, proper head positioning (raising the head so that the neck is flexed to approximately 45 degrees), and prior recognition of anatomic abnormalities. Smith stressed proper securing of the endotracheal tube and the use of a more pliable polyvinyl tube to help reduce motion-associated trauma during the course of the anesthetic. To reduce the role of chemical irritation in pediatric tracheitis, Smith recommended rinsing endotracheal tubes to remove excess sterilizing solution and avoiding the use of lubricating ointments with anesthetic properties on endotracheal tubes. He found that dipping the endotracheal tube in water prior to insertion was usually more than adequate to help facilitate passage through the vocal cords. Smith also recognized the role contamination played in development of post-intubation tracheitis and stressed proper hand hygiene prior to intubation.

In 1954[5], Smith outlined the advantages and disadvantages of pediatric endotracheal intubation. Pediatric endotracheal intubation permitted control of the airway when the head is inaccessible to the anesthetist, control of ventilation in the open chest, ventilatory assistance in the prone position, prevention of aspiration, better relaxation for abdominal surgery, and provision for resuscitation. Smith also noted the disadvantages, which included reduction of the tracheal lumen by presence of the endotracheal tube, longer induction time, deeper plane of anesthesia required for maintenance, post-intubation hoarseness and cough, chipped or dislodged teeth, irritation and injury of the pharynx, glottis and trachea, hypoxia, spasm and reflex activity, disturbances associated with extubation, kinking of the endotracheal tube, mainstem intubation, aspiration of the endotracheal tube, and impeding the work of the surgeon.

Dr. Smith was obviously cognizant of the role of public relations. He concluded his paper by warning, "Although routine intubation has been performed by skilled workers with minimal complications, general teaching of this practice would lead to unwarranted morbidity and mortality in the hands of the inept. If endotracheal anesthesia is misused or exploited, it will justly come under the general suspicion and distrust of surgeons, patients and lawyers." [5]

References

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