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Editorial

Special issue on Pediatric Anesthesia

Children are not little adults: a special issue on pediatric anesthesia

Hee Young Kim[1,2]

[1]Department of Anesthesia and Pain Medicine, Pusan National University Yangsan Hospital, [2]Department of Anesthesia and Pain Medicine, School of Medicine, Pusan National University, Yangsan, Korea

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Corresponding author
Hee Young Kim, M.D., Ph.D.
Department of Anesthesia and Pain Medicine, School of Medicine, Pusan National University, 49 Busandaehak-ro, Mulgeum-eup, Yangsan 50612, Korea
Tel: 82-55-360-2129
Fax: 82-55-360-2149
E-mail: anekhy@pusan.ac.kr

When discussing pediatric patients, many experts emphasize the phrase, “Children are not small adults” [1,2]. Approximately six centuries ago, European painters depicted children as miniature adults (Fig. 1A). However, during the Renaissance period, artists realized that children were not simply scaled-down adults. As seen in Raphael's *Madonna and Child* (Fig. 1B), children were portrayed as having large heads, long torsos, and short limbs. Today, it is well known that pediatric patients exhibit both physical and physiological differences and vulnerabilities [3].

Approximately six million pediatric patients undergo general anesthesia annually, of which 25% are infants [4]. The first pediatric anesthesia was administered in 1842, with doctors at that time recognizing that children experienced different anesthesia-related complications to those of adults [5]. Although all anesthesiology residents receive specialized training in areas such as pediatric anesthesia, and efforts to improve patient safety have reduced anesthesia-related mortality from 1:2,500 to 1:13,000 over the past 50 years [6,7], perioperative care of pediatric patients remains challenging and often requires a dedicated pediatric anesthesia care team [8].

This special issue of *Anesthesia and Pain Medicine* (APM) on ‘Pediatric Anesthesia’ follows the 19th Conference of the Asian Society of Pediatric Anesthesiologists (ASPA 2023), held in conjunction with the 31st Annual Meeting of the Korean Society of Pediatric Anesthesiologists that took place in Seoul, South Korea, from June 16–18, 2023. Under the overarching theme of 'Equity and Quality in Pediatric Anesthesia,' this conference featured a world-class program with globally renowned experts in the field of pediatric anesthesia. Over 80 speakers from 20 countries delivered 84 lectures, some of which were included in special issues. Following the success of the conference, paper submissions were invited in the fall of 2023. After receiving diverse manuscripts from around the world and subjecting them to rigorous peer review, > 10 articles were published. The aim of this special issue is to gather scholarly and practical insights into pediatric anesthesia, providing a wide range of academic and clinical knowledge for pediatric anesthesiologists, as well as clinicians who find pediatric anesthesia challenging.

Goal-directed monitoring has already been established in adults; however, some monitoring devices used in pediatric patients have not been validated in children or are limited by size. Although short-term anesthesia is harmless for healthy children, it remains unclear whether the same holds true for high-risk neonates and infants undergoing mul-

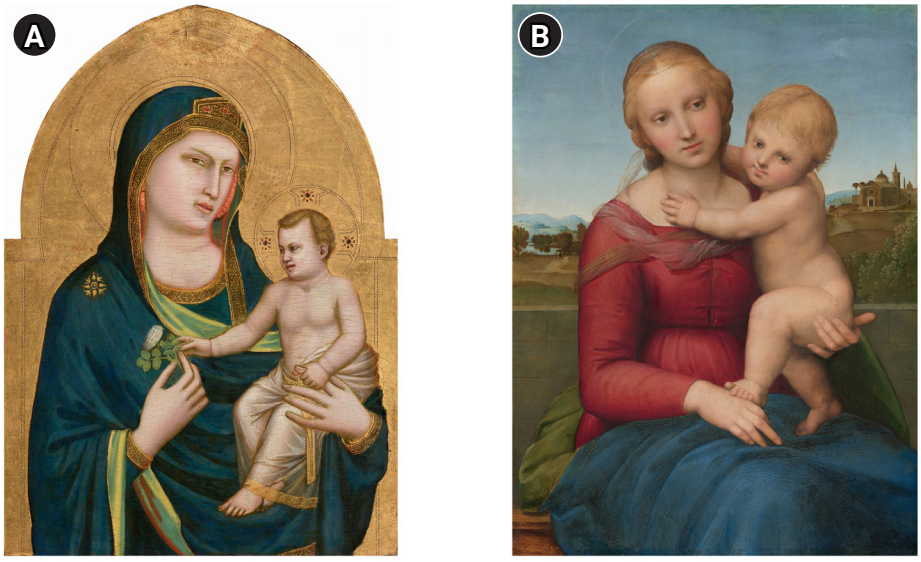

Fig. 1. (A) Madonna and Child, c. 1310/1315 painted by Giotto di Bondone, National Gallery of Art, Washington, D.C. (B) The Small Cowper Madonna, c. 1505 painted by the Italian High Renaissance artist Raphael, National Gallery of Art, Washington, D.C. Approximately six centuries ago, European painters depicted children as miniature adults (A); however, during the Renaissance period, children were portrayed with large heads, long torsos, and short limbs (B).

tiple procedures; moreover, there is no consensus on the safe limits of certain parameters [9,10]. It is difficult to define the optimal oxygen target during general anesthesia in pediatric and adult patients. According to the World Health Organization guidelines for perioperative oxygen use in adults, high-concentration oxygen has advantages in preventing surgical site infections. However, this guideline has limitations, as it does not include opinions on children [11,12]. According to Cho et al. [13], the optimal target for oxygenation in pediatric patients undergoing general anesthesia cannot be defined as a single unified range; various conditions before, during, and after surgery must be considered. The administration of neuromuscular blocking agents facilitates intubation and provides muscle relaxation during surgery; however, it can lead to serious complications, including respiratory depression, residual paralysis, and delayed recovery, making neuromuscular monitoring during surgery essential [14].

The brain is perhaps the most vulnerable yet least monitored organ. Accurate assessment of cerebral oxygen delivery is required for the intraoperative management of critically ill infants, and cerebral blood flow plays a critical role. Using transfontanelle ultrasonography, cerebral blood flow velocity can be measured through the fontanelle, which is useful for monitoring cerebral blood flow during cardiac surgery, facilitating the assessment of fluid responsiveness, intracranial pressure, cerebral emboli, and anatomical abnormalities such as hydrocephalus or intracranial hemorrhage [15].

Awakening and extubation during general anesthesia are high-risk periods, and in pediatric anesthesia, respiratory-related complications occur most frequently during the emergence and removal of endotracheal tubes or upper airway devices. Therefore, it is crucial for anesthesiologists to consider the patient's age, comorbidities, and physical condition when deciding on the timing and method of airway device removal. If the patient fails to maintain the airway and adequate ventilation after removal, necessary interventions should be promptly performed [16]. Failure of extubation can lead to increased morbidity and mortality rates. Thus, to ensure successful early extubation after pediatric cardiac surgery, proper patient selection, sound clinical judgment, a dedicated multidisciplinary team approach to achieve common goals, and good postoperative intensive care unit support are essential [17].

Pediatric regional anesthesia is rapidly advancing and plays a crucial role in pediatric anesthesia by providing analgesia without respiratory complications or nausea, while also reducing autonomic, fluid, metabolic, immune, and neuroendocrine stress responses to surgery [18]. Ponde et al. [19] focused on unique considerations related to pediatric regional anesthesia, such as the anatomical and physiologi-

cal characteristics of pediatric patients, as well as the doses and volumes of local anesthetics required for various blocks in neonates and infants, with the aim of providing practical guidance to clinicians.

Emergence delirium (ED) was first described in the 1960s by Eckenhoff et al. [20]. It remains a clinically significant issue, as it can cause short-term distress for pediatric patients, parents, and medical staff, and may lead to postoperative maladaptive behaviors that persist for weeks to months. Although predicting ED in pediatric patients remains challenging, recent advancements have employed intraoperative electroencephalographic (EEG) monitoring to improve prediction accuracy. Davies et al. [21] highlighted that intraoperative EEG monitoring could predict the occurrence of ED, and it may be possible to prevent ED by awakening the patient only after transitioning to a natural sleep state, following the appearance of appropriate EEG patterns. Several studies have found that when administered to patients in vulnerable states — such as during childhood, old age, or after injury — anesthetic drugs can have lasting harmful effects on brain function [22-24]. Cinquegrana et al. [25] described the effects of anesthetics on the developing brain during open fetal surgery, emphasizing the need for alternative uterine relaxation methods and minimization of anesthetic exposure to achieve optimal surgical conditions.

In conclusion, we extend our gratitude to the authors and reviewers who contributed their expertise in patient monitoring, airway management, regional anesthesia, and postoperative complications in this special issue. We hope that this review will play a significant role in integrating the latest research findings and expert recommendations, enabling clinicians to provide appropriate care for pediatric patients and enhance the safety and quality of anesthetic practice. We aspire to inspire further research and clinical advancements in the field of pediatric anesthesia.

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CONFLICTS OF INTEREST

Hee Young Kim has been an editor of the *Anesthesia and Paine Medicine* since 2022. However, She was not involved in the peer reviewer selection, evaluation, or decision process of this article. No other potential conflicts of interest relevant to this article were reported.

ORCID

Hee Young Kim, https://orcid.org/0000-0001-7809-8739

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