To the Editor: Sevoflurane and desflurane are the most common general anesthetics used in children. Previous study has shown that these agents can affect the electrocardiogram (ECG) markers,[1,2] leading to fatal ventricular arrhythmia. The followings were identified as useful indices for predicting and estimating the occurrence of a fatal arrhythmia: the interval between the peak and the end of T wave (Tp-Te),[3] the ratio of the Tp-Te interval to the QT interval (Tp-Te/QT)[4], and the JT interval (JT), which is measured from the end of the QRS complex to Te.[5] The QT interval may be affected by sex and age.[6] However, little is known about the co-effect of the inhaled agent and sex on the corrected QT (QTc) and Tp-Te/QT and Tp-Te/JT ratios.

This study explored the co-effect of inhaled anesthetics and sex on the prolongation of the QTc and the Tp-Te/QT and Tp-Te/JT ratios in children during anesthesia. Ethical approval for this study (No. H1412-021-631) was obtained from the Institutional Review Board of Seoul National University Hospital, Seoul, Korea, and registered at http://cris.nih.go.kr (No. KCT0001430). Pediatric patients (2–12 years) scheduled for minor surgery (<2 h) under general anesthesia were enrolled in this study. The exclusion criteria were as follows: a prolonged QT interval sufficient to induce fatal arrhythmia, electrolyte imbalances, hypothyroidism, the patient was taking medication that affects QT intervals, and showed no differences based on sex.

In total, 125 (sevoflurane, n = 63; desflurane, n = 62; M:F ratio = 61:64) out of 128 children completed the study. Sex, the inhaled anesthetic agent, and interaction between those factors did not influence the QT interval, QTc, or Tp-Te/QT and Tp-Te/JT ratios.

After testing for normality using the Shapiro-Wilk test, the normally distributed data were presented as mean ± standard deviation. The primary outcome was analyzed using a two-way analysis of variance and the secondary outcomes were analyzed using the Student’s t-test. P < 0.05 was considered statistically significant.

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Inhalation of Sevoflurane and Desflurane Can Not Affect QT Interval, Corrected QT, Tp-Te/QT or Tp-Te/JT in Children

Ji-Hyun Lee, Eun-Hee Kim, Young-Eun Jang, Jin-Tae Kim, Hee-Soo Kim
Department of Anesthesiology and Pain Medicine, Seoul National University Hospital, Seoul 03080, Korea

Address for correspondence: Ji-Hyun Lee, Department of Anesthesiology and Pain Medicine, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, Seoul 03080, Korea
E-Mail: dami0605@snu.ac.kr

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Many studies have investigated whether different inhaled agents have different effects on ECG-derived parameters such as the QTc, Tp‑Te ratio, JT, or QT dispersion. In the study, the QT interval, QTc, and Tp‑Te/QT and Tp‑Te/JT ratios were similar between sevoflurane and desflurane. Differences between our and previous results might be due to a variation in study designs, data collection time, or QT interval correction formula. Bazett’s formula is derived for the adult population and is not suitable for children with high heart rates. Nevertheless, Bazett’s formula still has the power to calculate the QTc in children. Similar to previous studies, the QTc interval was calculated using Bazett’s formula in the present study. Recently, Staikou et al. have reported the impact of anesthesia on torsadogenicity, as determined by ECG markers. The authors concluded that the lack of any effect on transmural dispersion of repolarization of heart possibly indicates that sevoflurane has no significant intrinsic torsadogenicity. On the contrary, desflurane was associated with a persistent QTc prolongation in children and a weak correlation between the increase of QT dispersion and occurrence of an arrhythmia was found. Therefore, desflurane might be more torsadogenic than sevoflurane.

This study had several limitations. First, since there is no standard formula to calculate QTc in children, Bazett’s formula was used. The second weakness was that we did not explore the interactions among sex, age, and type of inhaled anesthetic agent. Finally, we routinely used atropine during the induction of anesthesia; this could have affected the calculation of ECG-derived parameters.

In conclusion, sevoflurane or desflurane and sex cannot co-affect the QT interval, QTc, and Tp‑Te/QT and Tp‑Te/JT ratios in children during anesthesia.

### Declaration of patient consent
Written informed consent was obtained from the parents and children >7 years of age. The patients’ guardians have given their consent for reporting their images and other clinical information in the journal. The patients’ guardians understand that their names and initials will not be published and due efforts will be made to conceal their identity.

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Nil.

### Conflicts of interest
There are no conflicts of interest.

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### Table 1: QT interval, corrected QT interval, and Tp‑Te/QT and Tp‑Te/JT in boys and girls during baseline and anesthesia periods

| Items       | Boys (n = 61) | Girls (n = 64) | P   |
|-------------|--------------|----------------|-----|
| QT interval (ms) Baseline | 321.9 ± 39.1 | 309.1 ± 42.1 | 0.829 |
| Anesthesia  | 323.8 ± 38.4 | 317.8 ± 50.5 | 0.041* |
| Difference  | 6.3 ± 32.9   | 12.1 ± 32.0   | 0.672 |
| QTc (ms)    | 409.7 ± 20.2 | 400.0 ± 22.7  | 0.389 |
| Baseline    | 444.1 ± 30.0 | 433.6 ± 30.0  | 0.652 |
| Anesthesia  | 36.8 ± 27.4  | 35.1 ± 27.3   | 0.566 |
| Tp‑Te/QT    | 0.21 ± 0.04  | 0.21 ± 0.04   | 0.903 |
| Baseline    | 0.18 ± 0.06  | 0.18 ± 0.04   | 0.191 |
| Anesthesia  | −0.03 ± 0.06 | −0.03 ± 0.05  | 0.494 |
| Difference  | −0.03 ± 0.06 | −0.03 ± 0.05  | 0.494 |
| Tp‑Te/JT    | 0.28 ± 0.06  | 0.28 ± 0.05   | 0.610 |
| Baseline    | 0.24 ± 0.08  | 0.24 ± 0.06   | 0.208 |
| Anesthesia  | −0.03 ± 0.06 | −0.03 ± 0.05  | 0.494 |
| Difference  | −0.03 ± 0.06 | −0.03 ± 0.05  | 0.494 |

Values were shown as mean ± SD. *P<0.05 compared to baseline values. SD: Standard deviation.