Usefulness of respiratory sound within respiratory circuit monitoring for detecting laryngeal narrowing in anesthetized children managed with supraglottic airway devices

Shinichiro Kato, M.D.¹, Katsuhiko Ishibashi, M.D.¹, Yuji Kitamura, M.D.¹, Shiroh Isono, M.D.²
1. Department of Anesthesiology, Chiba University Hospital, Japan
2. Department of Anesthesiology, Graduated School of Medicine, Chiba University

BACKGROUND

- ✓ Use of supraglottic airway devices(SAD) for securing patent airway becomes a common technique even for small children under general anesthesia.
- ✓ However, it is well documented that serious respiratory complications often occur particularly at anesthesia emergence.
- ✓ Accordingly, early detection of the disordered breathing would improve safety and quality of anesthesia management.
- ✓ Respiratory sound monitoring with using a stethoscope on the chest wall has been a standard in pediatric anesthesia. However, potential usefulness of the respiratory sound monitoring at different sites have not been explored.
- ✓ We compared diagnostic usefulness of the respiratory sound monitoring at various sites for detecting airway narrowing such as laryngeal stridor, a common respiratory complication in small children anesthetized with SAD.

This study is a secondly analysis of a prospective clinical study in which primarily examines effects of sugammadex on laryngeal airway patency. (#1434 Changes of laryngeal airway patency in anesthetized children with supraglottic airway devices)

HYPOTHESES

- Hypothesis 1
Respiratory sound monitoring is able to detect laryngeal narrowing.
- Hypothesis 2
Respiratory sound monitoring within the respiratory circuit is superior to that on the chest wall and neck.

METHOD

- ✓ Microphones were placed for measuring respiratory sounds at three different locations: on the chest wall, neck, and within the airway circuit.
- ✓ Endoscopic images of the vocal cords were continuously monitored to detect laryngeal narrowing.

RESULT

- ✓ We studied 19 children divided into 2 groups; laryngeal narrowing group with under 30 degrees of vocal cord angle during spontaneous breathing and normal breathing group.
- ✓ Frequency analyses were performed for the inspiratory sounds to detect laryngeal narrowing.

Table. Children’s characteristics

	Laryngeal Narrowing (N=7)	Normal breathing (N=12)	P<0.05
Age	4Y5M ± 1Y6M	4Y2M ± 1Y5M	
Gender (M/F)	2 / 5	6 / 6	
Height [cm]	97 ± 12.9	100 ± 12	
Body weight [kg]	16 ± 5	17 ± 4	
Upper respiratory infection	2	1	
Vocal cord angle [degree]	24 ± 8	36 ± 5	*

Figure. Frequency analysis of inspiratory sounds at 3 different sites: on the chest wall, neck, and within the airway circuit respectively

DISCUSSION

- ✓ Microphones on the chest wall did not clearly and accurately detect the laryngeal narrowing during spontaneous breathing at emergence from anesthesia.
- ✓ In contrast, significantly higher power spectrum was detected by a microphone placed within the respiratory circuit in children with laryngeal narrowing due to direct acoustic transmission.

CONCLUSION

- ✓ Respiratory sound monitoring by a microphone placed within the respiratory circuit can be used as a sensitive monitor of the laryngeal airway patency in children with SAD.

The authors have no C.O.I. in this study.