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In-line head and neck position is preferable for tracheal intubation with the Airtraq laryngoscope compared to the sniffing position

Yoshihiro Hirabayashi and Norimasa Seo

Department of Anesthesiology and Critical Care Medicine, Jichi Medical University, 3311-1 Yakushiji, Shimotsuke, Tochigi 329-0498, Japan

Abstract
We aimed to determine which position, the in-line head and neck position or the sniffing position, was preferable for tracheal intubation with the Airtraq laryngoscope. In all, 20 anesthetists performed tracheal intubations on a manikin with either an in-line head and neck position or the sniffing position. There were no differences in the success rate and the time to intubation between the two positions. The overall number of teeth clicks was lower in the in-line head and neck position than in the sniffing position ($P < 0.05$). The score for preference of position, on a visual analogue scale, was better for the in-line head and neck position than for the sniffing position ($P < 0.01$). We concluded that the in-line head and neck position was preferable for tracheal intubation with the Airtraq laryngoscope compared to the sniffing position.

Key words Intubation · Intratracheal · Laryngoscope · Videolaryngoscope

The Airtraq laryngoscope (Prodol, Vizcaya, Spain) is an optical laryngoscope for tracheal intubation. As the shape of the Airtraq is in accord with the anatomy of the oropharyngeal structures, it provides an unobstructed view of the glottis through a non-line-of sight view [1–4]. In contrast, the conventional Macintosh laryngoscope requires certain airway manipulation for laryngeal exposure, which involves alignment of the oral, pharyngeal, and tracheal axes. Placing a pillow under the patient's head, and subsequent head extension, facilitates direct exposure of the larynx. With respect to the Airtraq, the importance of such a step is not clear. To determine the preferable head and neck position for tracheal intubation with the Airtraq laryngoscope, we compared intubation conditions in a manikin model held in an in-line head and neck position with those in the manikin held in the sniffing position.

Address correspondence to: Y. Hirabayashi
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Twenty anesthetists, with no prior experience using the Airtraq, were given a short demonstration of the device by one of the investigators; this included a demonstration of the intubation technique and the manufacturer's instructions regarding the correct use of the device. Each participant was then allowed practice intubations on an AirSim (TruCorp, Belfast, UK) manikin for 5 min. At each stage, all participants successfully performed tracheal intubations with the new device. The actual examination was performed on an Airway Management Trainer (Laerdal, Kent, UK). Each participant placed a 7-mm cuffed tube into the trachea using the Airtraq laryngoscope. The manikin was held in either an in-line head and neck position without a pillow or in the sniffing position with a pillow (7 cm in height). The sequence in which each participant tried the positions was randomly assigned using sealed envelopes. Each operator repeated the examination three times, and the sequence of the positions was alternated at each examination. The duration of each tracheal intubation attempt was defined as the time taken from insertion of the Airtraq between the teeth until its removal. An investigator verified a successful intubation. A failed intubation attempt was defined as an attempt that required more than 120 s to perform. Dental trauma was estimated based on the number of audible teeth clicks with the manikin. Participants scored their preference for each of the head and neck positions on a visual analogue scale (VAS; from 0 mm, desirable, to 100 mm, undesirable). The Airtraq is a single-use device, but the batteries will last approximately 60 min. As the present evaluation was performed on manikins, we re-used the Airtraq. Data were analyzed using Student's *t*-test, the Mann-Whitney *U*-test, or the χ^2 test. A *P* value of less than 0.05 was considered statistically significant.

Table 1 shows the tracheal intubation data with the Airtraq on the manikin held in the in-line and sniffing positions. There was no significant difference between

Table 1. Differences in tracheal intubation procedures using the Airtraq on a manikin held in in-line and sniffing positions

	In-line position	Sniffing position	*P* value
Overall success rate	98% (59/60)	95% (57/60)	0.309
Time to intubation (sec)	18 ± 19 (n = 59)	24 ± 19 (n = 57)	0.095
Overall number of teeth clicks	9	52	0.021
VAS for ease of use (mm)	34 ± 26	57 ± 26	0.008

Values are means ± SD or times

the positions in the success rate or the time required for instrumentation. The overall number of teeth clicks was significantly lower in the in-line head and neck position than in the sniffing position ($P < 0.05$). The in-line head and neck position scored better on the VAS than did the sniffing position ($P < 0.01$).

The results of the manikin study indicate that the placement of a pillow under the head for the sniffing position during tracheal intubation with the Airtraq does not seem to provide any advantage or speedier instrumentation. From the viewpoint of dental damage and ease of use, the in-line head and neck position is preferable for tracheal intubation using the Airtraq.

The accepted head and neck positioning for direct laryngeal exposure with the conventional Macintosh laryngoscope is the sniffing position with a pillow under the patient's head. This position facilitates the alignment of the oral, pharyngeal, and tracheal axes. The Airtraq provides an image of the glottis without the alignment of these three axes. It is not necessary to place pillows under the head to assist in holding the patient in the sniffing position during indirect laryngeal exposure. On the contrary, placing a pillow under the head significantly increased in the number of audible teeth clicks with the manikin, compared to the result for the in-line head and neck position.

We acknowledge the limitations of airway management manikins. In humans, head elevation and neck extension loosen the bite of the jaws, making insertion of the airway device into the mouth easy. In contrast, opening the mouth of the Airway Management Trainer is somewhat difficult and it is not easy to maintain the sniffing position. With the Airway Management Trainer, head elevation does not lead to a widening of the mouth opening. In contrast, the AirSim has a spring-loaded jaw mandible and its mouth opening is the full range of the jaw, although it does not have a sensor system for dental damage. The use of a manikin equipped with a damage sensor highlighted the difference in intubation conditions between the two positions. However, the rate of dental damage estimated by the numbers of teeth clicks in the present study may be far in excess of that actually observed, and hence the results may overestimate the dental damage compared with that in the clinical situation.

In order to rule out the training effect of practice intubation, we used different manikins for the practice and test situations. During the practice intubation, participants were allowed to intubate the trachea of the AirSim. Although no pillow was placed under the head of the AirSim at the practice intubation, the head and neck position was close to simple extension of the head and neck, but not the in-line position. Changing the manikin could have excluded the training effect from the examination.

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