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Parker Flex-Tip Tube® provides higher intubation success with the Pentax-AWS Airwayscope® despite the AWS tip being inserted into the vallecula

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Abstract: The Parker Flex-Tip® tube, in combination with the Pentax-Airway scope® (AWS), is anecdotally reported to facilitate intubation when the AWS tip fails to be inserted behind the epiglottis. We examined whether the Parker tube facilitates intubation when the AWS tip is inserted into the vallecula. Forty patients were randomly assigned into either standard or Parker tube group. Following general anesthesia induction, AWS intubation was attempted with the blade tip inserted into the vallecula. After obtaining an optimal laryngeal view, the tube was advanced toward the glottis. The laryngoscopist allowed additional adjustment of the blade tip direction when the first tube insertion failed due to involvement or folding of the epiglottis resulting from advancement of the tube. The primary outcome was defined as the success rate for intubation, and secondary outcome as the time needed for tube placement. The Parker tube provided both a higher intubation success rate (17/20 vs 4/20, $p<0.01$), and a faster intubation time (17±5 vs 25±4, $p<0.01$), than the standard tube. We conclude the use of the Parker tube in combination with the AWS is an optional technique allowing the laryngoscopist to obtain more reliable intubation success despite insertion of the AWS tip into the vallecula.

The Pentax-AWS Airway Scope® (AWS, HOYA, Tokyo, Japan) is a rigid indirect video-laryngoscope with integrated tube guidance [1]. When compared to the conventional Macintosh laryngoscope, the AWS has been proved to be an effective intubation device not only for patients with normal airways [2], but also for cases with difficult airways [3].

The manufacturer's manual suggests that the AWS's blade tip should be inserted behind (the glottic side of) the epiglottis for laryngeal exposure, but it may sometimes be difficult to insert the blade tip behind the epiglottis, which difficulty results in failed intubation [4,5]. In such a circumstance, conversion from oral to nasal intubation is proposed for successful intubation[6]. Also, the use of a tube introducer is helpful as it can extend the range of movement available while advancing the tube by rotating the introducer's angled tip [7,8].

We previously reported the use of Parker Flex-Tip tube® as an alternative solution when the AWS tip can not be inserted behind the epiglottis [9]. In that report, we conducted a mannequin study and speculated that the tapered, curved tip design of the Parker tube was responsible for the successful intubation. Therefore we conducted a human study to prove our hypothesis that the Parker tube facilitates intubation with the AWS tip inserted into the vallecula.

The protocol was approved by the institutional research committee, and written informed consent was obtained from forty ASA I – III patients aged over eighteen years before anesthesia. The patients had all been scheduled for elective surgery requiring general anesthesia with orotracheal intubation. Mallampati classification without phonation and thyromental distance was evaluated before surgery and recorded for all patients.

Before induction of anesthesia, patients were randomly assigned to two groups determined by sealed envelope technique. Patients in the Standard tube group were intubated using a standard bevel Phycon® tube (Fuji System, 7.5mm ID, 10 mm OD). In the Parker tube group, a Parker flex-tip tube® (Kobayashi Medical, 7.5mm ID, 10mm OD) was used.

Patients were placed in the supine, neutral neck position with a pillow and then

they breathed 100% oxygen for 3 minutes. Induction of anesthesia was performed with propofol (1.5-2.0 mg/kg) , fentanyl (1 μg/kg) and rocuronium (0.6mg/kg) intravenously. After complete paralysis, as confirmed by peripheral nerve stimulation, intubation was performed with the AWS. The blade used for this study was of standard adult size.

During laryngoscopy, the AWS tip was inserted into the vallecula to elevate the epiglottis indirectly. After obtaining laryngeal exposure, the view was evaluated to determine the percentage of the glottic opening (POGO), and the tube was advanced toward the glottis. If the laryngoscopist felt abnormal resistance or if folding epiglottis occurred during advancement of the tube during the first intubation attempt, he withdrew the tube and adjusted the AWS tip position before re-advancing the tube (second attempt). If the intubation was not completed on this second attempt, intubation was determined to have failed and the tube was inserted into the trachea using direct elevation of the epiglottis.

Our primary outcome is the success rate of the intubation. Secondary outcome of time to complete intubation was defined as the time taken from the blade passing the incisors until passage of the tracheal tube was completed. Postoperative hoarseness and sore throat were also noted after anesthesia.

Intubation success rates were compared by a chi-square test. Intubation time and POGO were compared by unpaired t-test. Results are expressed as mean± standard deviation (SD). $P<0.05$ considered statistically significant. According to our preliminary mannequin study, the success rate on the first attempt for the Parker tube was 0.7 and for standard tube, it was 0.2. Considering an α error of 0.05 and β error of 0.2, we estimated that 19 patients in each group would be required to provide statistically significant data. We consequently chose to enroll a total of 40 patients.

Results are shown in table 1. Patient profiles did not differ from group to group. The POGO score at intubation was not different between groups. Intubation success rate on the first or second attempt was significantly higher in Parker tube group (17/20 vs 4/20, $p<0.01$). Time to complete intubation was significantly longer in the standard tube group (17±5 vs 25±4, $p<0.01$). Incidence of postoperative laryngeal morbidity was not significantly different.

Our results indicate that the Parker-Flex Tip tube facilitates intubation with the AWS under conditions of indirect epiglottic elevation when compared to the standard bevel tube. Success rate was 70% on the first attempt and increased to 85% inclusive of the second attempt. This is comparable to our previous mannequin study [5]. Intubation time was significantly shorter in Parker tube group, as the standard tube group spent additional time maneuvering the blade for direct elevation of the epiglottis in more than half of the cases. Postoperative complications were comparable between groups.

For standard AWS intubation, direct epiglottic elevation is preferred as the manufacture's manual suggests. As we have reported, a high frequency of intubation failure results when the tip is inserted into the vallecula with the standard bevel tube [5]. However, the current study demonstrates that the use of the Parker tube is a simple method to increase the likelihood of intubation success without altering the intubation maneuver or using additional tools. When combined with the Parker tube, AWS can be used not only with direct elevation of the epiglottis (Miller type approach), but also with indirect elevation (Macintosh type approach) for laryngeal exposure to intubate the patient's trachea.

We have reported that there exists a higher probability for the AWS blade inserted to enter the vallecula in a patient with normal teeth than a patient with full dentures, probably due to decreased working space for AWS blade manipulation [10]. Our results indicate that there is a greater likelihood of successful intubation without changing the blade tip position for laryngeal exposure when the Parker tube was already set in the channel.

Finally, there are some limitations in the scope of this study. We have only studied the standard adult blade. The effect of Parker tube use in combination with later blade types, such as those for neonates and infants, or with thinner adult blade types are still not known. Additionally, we included only patients displaying normal airway anatomy in the study and thus the efficacy of this technique under conditions in which the AWS tip is unable to reach the larynx is not known.

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Table legends

[Table 1]. Patient Characteristics and Intubation profiles

	Standard tube	Parker tube	significance
ASA PS(I/II/III)	12/5/3	11/6/3	NS
Age	61±12	58±13	NS
Height	157±7	159±9	NS
Weight	56±9	58±15	NS
TMD	6.4±0.5	6.5±0.7	NS
POGO	68±14	65±15	NS
Success rate at 1st attempt	4/20	14/20	P<0.01
Success rate by 2nd attempt	6/20	17/20	P<0.01
Intubation time	25±4	17±5	P<0.01
Postoperative sorethroat	8/20	4/20	NS
Postoperative hoarseness	4/20	2/20	NS

Data are presented in mean±SD or actual number

NS: not significant

ASA PS: Amarican Society of Anesthesiology Physical Status, TMD:Thyromental distance, POGO: Percentage of glottic opening,