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COMPARISON OF METAL AND PLASTIC DISPOSABLE LARYNGOSCOPE BLADE WITH REUSABLE MACINTOSH BLADE IN DIFFICULT AND INHALATION INJURY AIRWAY SCENARIO: A MANIKIN STUDY

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□ **Abstract—Background: Single-use plastic blades (SUPB) and single-use metal blades (SUMB) for direct laryngoscopy and tracheal intubation have not yet been compared with reusable metal blades (RUMB) in difficult airway scenarios. Objective: The purpose of our manikin study was to compare the effectiveness of these different laryngoscope blades in a difficult airway scenario, as well as in a difficult airway scenario with simulated severe inhalation injury. Methods: Thirty anesthetists performed tracheal intubation (TI) with each of the three laryngoscope blades in the two scenario manikins. Results: In the inhalation injury scenario, SUPB were associated with prolonged intubation times when compared with the metal blades. In the inhalation injury scenario, both metal laryngoscope blades provided a quicker, easier, and safer TI. In the difficult airway scenario, intubation times were significantly prolonged in the SUPB group in comparison to the RUMB group, but there were no significant differences between the SUPB and the SUMB. In this scenario, the RUMB demonstrated the shortest intubation times and seems to be the most effective device. Conclusions: Generally, results are in line with previous studies showing significant disadvantages of SUPB in both manikin scenarios. Therefore, metal blades might be beneficial, especially in the airway management of patients with inhalation injury.** © **2016 Elsevier Inc. All rights reserved.**

□ **Keywords—difficult airway; inhalation trauma; laryngoscope blade; manikin study**

INTRODUCTION

Complications arising from difficult or failed tracheal intubation (TI) remain a leading cause of anesthesia-associated morbidity and mortality (1). There is a higher incidence of difficult and failed laryngoscopy and high laryngeal grade views when patients were managed in a prehospital setting (2). Inhalation injury has become the most frequent cause of death in acute phase of burn patients, and can be associated with a difficult airway caused by acute upper airway obstruction and the presence of soot in the pharynx (3–5). Therefore, the equipment for TI in prehospital emergency care should meet the requirements for difficult intubation conditions, even in the presence of inhalation trauma. However, in prehospital emergency care, single-use plastic laryngoscope blades are often provided for TI for hygienic reasons. Dos Santos et al. described in their retrospective prehospital cohort study, conducted during two 3-year periods at a single university-based emergency medical services system, a plastic disposable blade intubation rate of > 40% (6). Several clinical studies suggested that the use of plastic disposable laryngoscope blades in prehospital emergency care decreases the success rate of TI when compared with reusable metal laryngoscope blades, which might have a distinct impact to difficult airway scenarios (6,7). However, disposable

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metal blades have not been compared with reusable metal and disposable plastic blades in difficult airway scenarios in a single study. The purpose of this study was to compare the effectiveness of a single-use plastic blade (SUPB), a single-use metal blade (SUMB), and a reusable metal blade (RUMB) in a simulated difficult airway scenario caused by a rigid cervical collar, as well as in a simulated inhalation injury airway scenario that combines a difficult airway and a limited view caused by a sooted pharynx.

MATERIALS AND METHODS

Thirty anesthetists with a median clinical experience of 3.5 years (interquartile range 2−6 years) voluntary participated in this randomized crossover trial. Data were anonymized and information on the performance of individual participants was not made available to anybody outside the research team. We notified local ethics committee of the University Erlangen-Nürnberg about the study. The ethics committee waived a formal submission for approval.

Each anesthetist performed TI with a SUMB (disposable Macintosh cold light laryngoscope blade, size 3, P.J. Dahlhausen & Co. GmbH, Cologne, Germany), a SUPB (disposable laryngoscope blade Macintosh, size 3, Intersurgical GmbH, Sankt Augustin, Germany), and a RUMB (reusable X-LITE Macintosh laryngoscope blade, size 3, Wirutec Rüsch Medical Vertriebs GmbH, Sulzbach, Germany) (Figure 1) in a difficult airway scenario manikin (Laerdal Medical AS, Stavanger, Norway), as well as an inhalation injury airway scenario manikin (Erlanger Inhalation Injury Manikin, a modified Laerdal Medical AS manikin) (Figure 2).

Figure 1. The three different laryngoscope blades used in this study. From top to bottom: single-use metal blade (disposable Macintosh cold light laryngoscope blade, size 3, P.J. Dahlhausen & Co. GmbH, Cologne, Germany), single-use plastic blade (disposable laryngoscope blade Macintosh, size 3, Intersurgical GmbH, Sankt Augustin, Germany), and the reusable metal blade (reusable X-LITE Macintosh laryngoscope blade, size 3, Wirutec Rüsch Medical Vertriebs GmbH, Sulzbach, Germany).

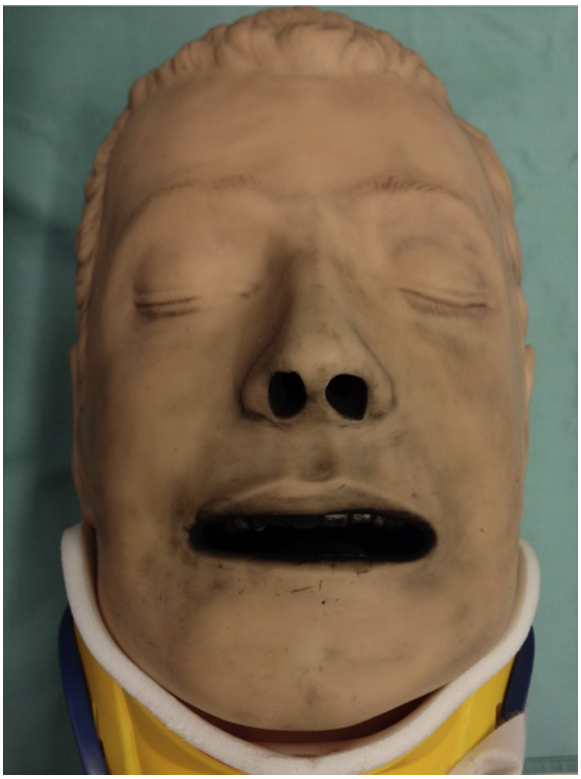

Figure 2. Erlanger Inhalation Injury Manikin, a modified Laerdal Medical AS manikin. The difficult airway is simulated by cervical immobilization applying a cervical collar. The pharynx is pigmented with activated carbon.

To simulate an inhalation injury, the pharynx of the Erlanger Inhalation Injury Manikin was pigmented with activated carbon (Figure 3). The neck of both manikins was fixed in a neutral position by a rigid cervical collar and thus the distance between the free edge of the upper and lower incisors (interdental distance) was limited. These conditions turned it into a difficult intubation model (8).

Figure 3. Oropharynx of the Erlanger Inhalation Injury Manikin. To simulate an inhalation injury, the pharynx is pigmented with activated carbon.