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## SCIENTIFIC ARTICLE

### Comparison of King Vision video laryngoscope and Macintosh laryngoscope: a prospective randomized controlled clinical trial

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#### KEYWORDS

Airway management;  
Direct laryngoscopy;  
Endotracheal  
intubation;  
General anesthesia;  
Video laryngoscopy

#### Abstract

**Background and objectives:** We compared the efficiency of the King Vision video laryngoscope and the Macintosh laryngoscope, when used by experienced anesthesiologists on adult patients with varying intubating conditions, in a prospective randomized controlled clinical trial.

**Methods:** A total of 388 patients with an American Society of Anesthesiologists physical status of I or II, scheduled for general anesthesia with endotracheal intubation. Each patient was intubated with both laryngoscopes successively, in a randomized order. Intubation success rate, time to best glottic view, time to intubation, time to ventilation, Cormack-Lehane laryngoscopy grades, and complications related to the laryngoscopy and intubation were analyzed.

**Results and conclusions:** First pass intubation success rates were similar for the King Vision and the Macintosh (96.6% vs. 94.3%, respectively,  $p > 0.05$ ). King Vision resulted in a longer average time to glottic view (95% CI 0.5–1.4s,  $p < 0.001$ ), and time to intubation (95% CI 3–4.6s,  $p < 0.001$ ). The difference in time to intubation was similar when unsuccessful intubation attempts were excluded (95% CI 2.8–4.4s,  $p < 0.001$ ). Based on the modified Mallampati class at the preoperative visit, the King Vision improved the glottic view in significantly more patients (220 patients, 56.7%) compared with the Macintosh (180 patients, 46.4%) ( $p < 0.001$ ). None of the patients had peripheral oxygen desaturation below 94%. Experienced anesthesiologists may obtain similar rates of first pass intubation success and airway trauma with both laryngoscopes. King Vision requires longer times to visualize the glottis and to intubate the trachea, but does not cause additional desaturation.

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## PALAVRAS-CHAVE

Manejo de vias  
áreas;  
Laringoscopia direta;  
Intubação  
endotraqueal;  
Anestesia geral;  
Videolaringoscopia

## Comparação entre o videolaringoscópio King Vision e o laringoscópio Macintosh: um ensaio clínico prospectivo randomizado e controlado

### Resumo

**Justificativa e objetivos:** Comparamos a eficiência do videolaringoscópio King Vision e do laringoscópio Macintosh, quando usados por anestesiologistas experientes em pacientes adultos com diferentes condições de intubação, em um estudo clínico prospectivo randomizado e controlado.

**Métodos:** Um total de 388 pacientes com estado físico ASA I ou II (de acordo com a classificação da American Society of Anesthesiologists – ASA), programados para anestesia geral com intubação endotraqueal. Cada paciente foi entubado com ambos os laringoscópios sucessivamente, em uma ordem aleatória. A taxa de sucesso da intubação, o tempo até a melhor visibilização da glote, o tempo de intubação, o tempo de ventilação, a classificação de Cormack-Lehane (graus) e as complicações relacionadas à laringoscopia e intubação foram analisados.

**Resultados e conclusões:** As taxas de sucesso na intubação na primeira tentativa foram similares para o King Vision e o Macintosh (96,6% vs. 94,3%, respectivamente,  $p > 0,05$ ). As médias dos tempos até a melhor visibilização da glote (IC 95% 0,5–1,4s,  $p < 0,001$ ) e de intubação (IC 95% 3–4,6s,  $p < 0,001$ ) foram maiores no King Vision. A diferença no tempo de intubação foi semelhante quando as tentativas mal sucedidas de intubação foram excluídas (IC 95% 2,8–4,4s,  $p < 0,001$ ). Com base na classificação de Mallampati modificada na consulta pré-operatória, o King Vision melhorou significativamente a visibilização da glote em mais pacientes (220 pacientes, 56,7%) em comparação com o Macintosh (180 pacientes, 46,4%) ( $p < 0,001$ ). Nenhum dos pacientes apresentou dessaturação periférica de oxigênio abaixo de 94%. Os anestesiologistas experientes podem obter taxas semelhantes de sucesso na primeira tentativa de intubação e de traumas das vias aéreas com ambos os laringoscópios. O King Vision requer tempos mais longos até a visibilização da glote e de intubação traqueal, mas não causa dessaturação adicional.

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## Introduction

Securing the patient's airway is essential in general anesthesia. Airway management problems constitute 17% of anesthesia closed claims, with difficult intubation being the most common at a rate of 5%.<sup>1</sup> Problems like delayed intubation, misplaced tracheal tube, or airway trauma are frequently encountered in outpatient settings, and can cause death or hypoxic brain damage.<sup>2,3</sup>

Video laryngoscopes have been proven useful for intubating patients with difficult airways.<sup>4</sup> With a camera and light source on the tip of its blade, the King Vision video laryngoscope (KVVL) provides indirect glottic view without needing to align the oral-pharyngeal-tracheal axis. This allows for less tissue damage during laryngoscopy, leading to KVVL's successful use in awake intubations.<sup>5</sup> Several studies have reported that KVVL provided better glottic views in comparison with other laryngoscopes when used by novice personnel or in manikin studies simulating difficult airway scenarios.<sup>6–8</sup> It remains unclear, however, whether these results can translate into higher intubation success rates or shorter time to intubation when KVVL is used by experienced anesthesiologists.<sup>9,10</sup>

This study aimed to compare the efficiency of using a KVVL with a standard size 3 channeled blades versus the use of a Macintosh laryngoscope, on adult patients with varying intubating conditions, scheduled for general anesthesia. In

cases where using the KVVL channeled blade proved unsuccessful, the Macintosh laryngoscope was instead compared to the KVVL using a non-channeled blade.

## Materials and methods

This study was approved by the Local Ethics Committee (n° 2014/109) and registered in ClinicalTrials.gov (Identifier: NCT02482870). All patients signed an informed consent form prior to their inclusion in the study.

All patients scheduled for general anesthesia with endotracheal intubation in a University Hospital were included in the study. Exclusion criteria included emergency surgery, age below 18 years or above 60 years, inter-incisor distance <2 cm, American Society of Anesthesiologists (ASA) score >2, ankylosis, degenerative osteoarthritis, glottic or supraglottic mass (like lingual thyroid or tonsillar hypertrophy), mediastinal masses, oropharyngeal anomaly (like subglottic stenosis), and having Treacher-Collins, Pierre Robin, or Down syndrome. Patients were also excluded if they had a history of surgery, or scheduled surgery, for any of these conditions.

On the day of surgery, allocated patients were taken into the operating room and given  $0.04 \text{ mg} \cdot \text{kg}^{-1}$  of intravenous midazolam premedication, before their airways were evaluated and anthropometric measurements (thyromental and sternomental distance, modified Mallampati class) were recorded.<sup>11</sup> The study's flow diagram can be found

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