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Original Contribution

Intraocular pressure changes: the McGrath video laryngoscope vs the Macintosh laryngoscope; a randomized trial

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Abstract

Study Objective: To determine the effects of the McGrath Series 5 video laryngoscope on intraocular pressure (IOP) during laryngoscopy.

Design: Prospective, randomized, double blind.

Setting: Operating room.

Patients: Eighty adult patients of American Society of Anesthesiologist physical status 1 scheduled for non-ophthalmic elective surgery under general anesthesia.

Interventions: The endotracheal intubation was provided using McGrath series 5 video laryngoscope in MG group (n = 40) or Macintosh laryngoscope in M group (n = 40).

Measurements: The IOP of the right and left eyes was measured before and after the laryngoscopic process.

Main Results: The mean arterial blood pressure values just before laryngoscopy and intubation and after intubation were 77.38 ± 6.18 and 97.38 ± 12.77 in the McGrath video laryngoscope group and 75.85 ± 7.88 and 99.12 ± 14.30 in the Macintosh laryngoscope group, respectively. The IOP values of the left eye after intubation and at the 5th and the 10th minutes in the Macintosh laryngoscope group were found to be significantly higher than those in the McGrath video laryngoscope group ($P = .019$, $P = .019$, and $P = .007$, respectively). In addition, the IOP values of the right eye were found to be higher after intubation and at the 5th and the 10th minutes in the Macintosh laryngoscope group, compared to the McGrath video laryngoscope group ($P = .009$, $P = .021$, and $P = .011$, respectively). The mean IOP values

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for the left eye just before laryngoscopy and intubation and after intubation were 10.65 ± 2.52 and 15.57 ± 3.62 in the McGrath video laryngoscope group, and for the right eye, they were 10.60 ± 1.64 and 17.17 ± 2.38 in the Macintosh laryngoscope group, respectively.
Conclusion: The McGrath Series 5 video laryngoscope may provide a lower IOP level compared to the Macintosh laryngoscope in an otherwise healthy, young patient population.

1. Introduction

The stability of the intraocular pressure (IOP) plays an important role during ophthalmic surgery and can affect the quality of the procedure. Therefore, the establishment of optimum conditions requires appropriate anesthesia management. Alterations in the systemic blood pressure, aqueous humor dynamics, choroidal blood volume, central venous pressure, and extraocular muscle tone all affect the IOP [1–5]. It is known that conventional laryngoscopy leads to a significant hemodynamic response that results in an increased IOP [6,7].

Laryngoscopy causes an increase in the catecholamine level and blood pressure, which is considered to be caused by the adrenergic response of the supraglottic area when it is disturbed by the laryngoscope blade [10,11]. Currently, new devices, such as video laryngoscopes, have entered into clinical use and are capable of providing minimal hemodynamic changes when compared to direct laryngoscopes. This can be associated with the lower lifting forces applied to the supraglottic area to obtain a clear view of the glottis [8–11]. The McGrath Series 5 video laryngoscope (Aircraft Medical Ltd, Edinburg, UK) is one of these devices, which has a high-resolution video camera, an angulated blade of adjustable length, and a light source at the cone end of the blade, providing a better glottic view than direct laryngoscopes. However, there are no existing data on its effects on IOP [12,13].

The aim of the current study is to compare the hemodynamic and IOP responses during the intubation process, using either the McGrath Series 5 video laryngoscope or the Macintosh laryngoscope.

2. Materials and methods

2.1. Subjects

After obtaining approval from the Gaziosmanpasa University Clinical Researches Ethics Committee (13-KAEK-154) and written informed consent, 80 patients with an American Society of Anesthesiologists physical status of 1 scheduled for nonophthalmic elective surgery were enrolled into this study. These surgeries were performed under general anesthesia in the supine position, and the patient ages ranged from 20 to 50 years. A history of preexisting glaucoma or previous intraocular surgery, thyromental distance less than 6 cm, maximum mouth opening less than 3 cm, Mallampati score of 3 or 4, preanesthetic IOP greater than 20 mm Hg, number of intubation attempts more than 2, those at risk for regurgitation, those with contraindication to use of thiopental sodium and sevoflurane, and obstetric or laparoscopic surgery were the exclusionary criteria. Patients with eye diseases were ruled out by the ophthalmologist preoperatively.

2.2. Methods

An intravenous line was secured, and routine monitoring (electrocardiogram, peripheral oxygen saturation, and noninvasive blood pressure) was performed for all patients in the operating room. In addition, to visualize the neuromuscular blocking agent, a train of four (TOF) was performed using a TOF-Watch SX (Organon Ltd, Drynam Road, Swords, Co, Dublin, Ireland). To assess the depth of anesthesia, which was kept between 40 and 60, a Bispectral Index Monitor Model 2000 (Aspect Medical Systems, Inc, Newton, MA) was used.

Before the induction of anesthesia, all patients were randomly assigned to the 2 groups using the sealed envelope technique (based on computer-generated random numbers), where the Macintosh laryngoscope or McGrath video laryngoscope would be used (Macintosh laryngoscope group [M], n = 40; McGrath video laryngoscope group [MG], n = 40). A standard anesthetic technique was used for both groups. Orotracheal intubation was initiated after complete suppression of TOF was seen with the aid of a neuromuscular monitor.

A malleable stylet was inserted into the endotracheal tube, and the distal tip was angled upwards by 60° to 70°, just proximal to the cuff according to the angle of the blade for the McGrath video laryngoscope and no more than 30° for the Macintosh laryngoscope, to achieve successful intubation of the trachea. The cuff of the tracheal tube was inflated with air to provide a pressure of 15 cm H_2O and controlled using a handheld aneroid manometer. Volume-controlled ventilation was adjusted to maintain an end-tidal CO_2 level of 34 ± 2 mm Hg, tidal volumes of 8 to 10 mL/kg, and a respiratory rate of 12 ± 2 per minute.

The IOP measurement was performed using a Tono-Pen XL tonometer (Reichert, Inc, Depew, NY) by an investigator who was blind to the intubation device used. The preoperative baseline IOP was measured in the operating room, without any administration of anesthetics or sedative drugs, after the administration of proparacaine hydrochloride 0.5% drops to