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## Equipment Report

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### The McCoy levering laryngoscope in patients with limited neck extension

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**Purpose:** The McCoy levering laryngoscope is a modified Macintosh laryngoscope, which has a hinged tip controlled by a lever on the handle. The purpose of this study was to investigate whether the tip elevation of this laryngoscope results in better laryngeal visualization than using the Macintosh laryngoscope when the patient's neck is fixed in the neutral position.

**Methods:** Fifty female patients (ASA physical status I-II) undergoing elective surgery during general anaesthesia were investigated. The patient's neck was manually fixed in the neutral position by an assistant, and laryngeal visualization was attempted first with a size #3 Macintosh laryngoscope (Macintosh trial), and then with a size #3 McCoy levering laryngoscope with blade tip elevation (McCoy trial), and tracheal intubation was attempted. Trials of laryngeal visualization were evaluated with the Cormack score.

**Results:** In the Macintosh trial, 36 of 50 (72%) patients were evaluated grade 3, and two grade 4. In most of the patients graded 2 and 3 in the Macintosh trial (70% of the grade 2 and 83% of the grade 3 cases), the laryngeal view was improved by using the McCoy levering laryngoscope. The Cormack grade in the McCoy trial was less than that in the Macintosh trial ( $P < 0.01$ ). No complications were observed during the study.

**Conclusion:** The McCoy levering laryngoscope improved laryngeal visualization in patients whose neck cannot be extended.

**Objectif :** Le laryngoscope à levier de McCoy est un laryngoscope Macintosh modifié dont l'extrémité articulée est contrôlée par un levier située dans le manche. Cette étude visait à vérifier si l'élévation de l'extrémité de ce laryngoscope permettait de mieux visualiser le larynx que le laryngoscope de Macintosh quand la position de la tête était maintenue en position neutre.

**Méthodes :** Cinquante patientes (ASA I et II) soumises à une chirurgie gynécologique programmée non urgente sous anesthésie générale ont été étudiées. Un assistant maintenait la tête en position neutre et après avoir fait une première tentative de visualisation du larynx avec un laryngoscope Macintosh N° 3 (essai Macintosh) et l'avoir répétée avec un laryngoscope à levier McCoy N° 3 (essai McCoy), on essayait d'intuber la trachée. Les essais de visualisation laryngée étaient évalués sur l'échelle de Cormack.

**Résultats :** Durant l'essai Macintosh, 36 patientes sur 50 (72%) étaient considérées grade 3 et deux, grade 4. Chez la plupart des patientes grade 2 et 3 pendant l'essai Macintosh (70% des grades 2 et 83% des grades 3), la visualisation de la trachée était améliorée par le laryngoscope McCoy. Les grades de Cormack pendant l'essai McCoy étaient inférieurs à ceux de l'essai Macintosh ( $P < 0,01$ ). Aucune complication n'a été observée.

**Conclusion :** Le laryngoscope de McCoy améliore la visualisation de la trachée lorsque le cou n'est pas en extension.

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Accepted for publication March 6, 1997.

LIMITED neck extension is one of the major causes of difficult laryngeal visualization using a Macintosh laryngoscope. In such cases, physicians often chose an alternative approach, such as using a fibrescope, Bullard laryngoscope, or a light wand.

The McCoy levering laryngoscope (Penlon Ltd., Abingdon, England) is a modified Macintosh laryngoscope, which has a hinged tip controlled by a lever on the handle (Figure 1). Because of its unique design, the epiglottis can be easily elevated without stressful force to the upper incisors or stressful neck extension, and the McCoy laryngoscope can convert a Cormack grade 2 or 3 into grade 1 or 2 at intubation.<sup>1</sup> This new laryngoscope may help laryngeal visualization in patients with limited neck extension.

The purpose of this study was to examine the hypothesis that elevating the tip of the McCoy levering laryngoscope resulted in a lower Cormack score for laryngeal visualization than when using the Macintosh laryngoscope when the patient's neck was fixed in the neutral position. Because the blade size we used was equivalent to a size #3 Macintosh blade, only female patients were studied in this study.

#### Materials and methods

Institutional ethics committee approval was obtained for the study protocol.

Fifty female patients (ASA physical status I-II) undergoing elective surgery during general anaesthesia were investigated. Patients who had been considered to require awake fiberoptic intubation were excluded from the study. After general anaesthesia was induced with 5 mg·kg<sup>-1</sup> thiopentone and muscle relaxation was produced with 0.2 mg·kg<sup>-1</sup> vecuronium, the lungs were ventilated with sevoflurane in oxygen.

After complete paralysis had been confirmed with a nerve stimulator, the patient's neck was fixed in a neutral position by an assistant. The neutral position of the neck was judged by aligning the occlusal surface of the molar teeth or gums perpendicular to the floor. Then, laryngeal visualization was attempted first using a #3 Macintosh laryngoscope (Macintosh trial), and then with a #3 McCoy levering laryngoscope with blade tip elevation (McCoy trial). In the latter trial, the blade tip was elevated when the tip was in the vallecula.

All trials of laryngeal visualization were evaluated with the scoring system described by Cormack *et al.*<sup>2</sup> Grade 1=most of the glottis visible, Grade 2=no more than the arytenoid cartilages visible, Grade 3: epiglottis visible, and Grade 4=failure to expose even the epiglottis.

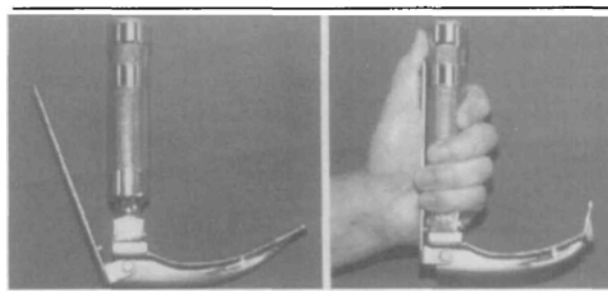


FIGURE 1 Lateral view of the McCoy levering laryngoscope. Its hinged tip is elevated by a lever on the handle.

When the laryngeal view was evaluated as grade 1 or 2 in the McCoy trial, tracheal intubation was attempted with the patients' neck in a neutral position. If tracheal intubation was unsuccessful, intubation was attempted again with neck extension. In grade 3 or 4 patients tracheal intubation was attempted with neck extension. Cases of difficult intubation were to be managed using the ASA difficult airway management algorithm.<sup>3</sup>

The Cormack score of each trial was compared using the Wilcoxon signed rank test. A *P*-value <0.05 indicated significance.

#### Results

When the patients' necks were fixed in the neutral position, laryngeal visualization with the Macintosh blade was relatively poor (Table I). Thirty-six of 50 (72%) patients were evaluated as grade 3, and two as grade 4. In most of the patients whose Cormack grades were 2 and 3 in the Macintosh trial (70% of the grade 2 and 83% of the grade 3 cases), the laryngeal view was improved using the McCoy levering laryngoscope (Table I). The McCoy laryngoscope failed to improve the laryngeal view in two patients evaluated as grade 4 in the Macintosh trial. The Cormack grade in the McCoy trial was lower than in the Macintosh trial (*P* <0.01).

In all patients graded 1 or 2 in the McCoy trial, the tracheas were intubated with the tip elevation of the

TABLE I Comparison of laryngeal visualization with the Macintosh and the McCoy laryngoscopes.

<i>Macintosh</i>	<i>McCoy</i>
Grade 1 – 2	Grade 1 – 2 (100%)
Grade 2 – 10	Grade 1 – 7 (70%)
	Grade 2 – 3 (30%)
Grade 3 – 36	Grade 1 – 3 (8%)
	Grade 2 – 27 (75%)
	Grade 3 – 6 (17%)
Grade 4 – 2	Grade 4 – 2 (100%)

McCoy levering laryngoscope with the neck fixed in the neutral position. In eight patients graded 3 or 4 in the McCoy trial, the tracheas were intubated with neck extension using a McCoy laryngoscope with tip elevation. No complications were reported during this study.

### Discussion

This study showed that the McCoy laryngoscope improved laryngeal visualization in patients with the neck stabilized in the neutral position. However, tip elevation of the McCoy laryngoscope was less effective in grade 4 patients in the Macintosh trial.

The McCoy laryngoscope is designed to elevate the epiglottis with its hinged tip. This unique design has two advantages compared with the Macintosh laryngoscope. First, using the McCoy laryngoscope results in less force being applied during laryngoscopy,<sup>4</sup> and the stress response to laryngoscopy is reduced.<sup>5</sup> Secondly, difficult laryngeal visualization may be improved by lifting the epiglottis. Especially in patients with the neck fixed in the neutral position, this laryngoscope can improve the laryngeal view.<sup>1</sup>

Fixation of the neck in the neutral position worsened glottic exposure. In the Macintosh trial, the laryngeal view was evaluated grade 3 in 72% of patients. This is because the oral axis made an angle with the laryngeal axis, so that the epiglottis covered the glottis and interfered with laryngeal visualization (Figure 2a). In this situation, lifting the epiglottis with the McCoy levering laryngoscope improves glottis exposure, so that grade 3 view improved to grade 1 or 2 with blade tip elevation in 83% of patients (Figure 2b).

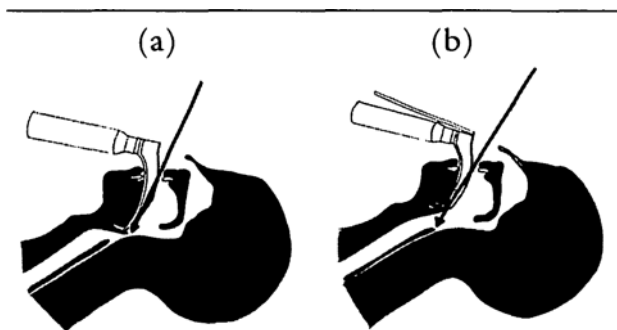


FIGURE 2 (a) When the patient's neck was fixed in the neutral position, the oral axis made an angle with the laryngeal axis, so that the epiglottis covered the glottis and interfered with laryngeal visualization.

(b) In this situation, tip elevation of the McCoy laryngoscope helps glottic exposure: grade 3 view may be improved to grade 1 or 2.

Laurent *et al.* reported the efficacy of the McCoy laryngoscope in patients with their neck held in the neutral position by manual stabilization, and the McCoy laryngoscope improved 83% of the Macintosh grade 2 patients and 86% of the Macintosh grade 3.<sup>6</sup> Although cricoid pressure was used during laryngeal visualization in their study, their results are compatible with those of the current study. Gabbott confirmed improvement of laryngeal view in patients whose necks were immobilized in a rigid cervical collar.<sup>7</sup> Despite limited mouth opening due to application of cervical collar, 96% of Macintosh grade 3 improved to grade 1 or 2. Therefore, the McCoy laryngoscope was considered to be a useful option for patients whose neck movement was impossible or undesirable.

However, there is a limit to the efficacy of this laryngoscope, because some grade 3 or 4 patients in the Macintosh trial remained in the same grade in the McCoy trial so that alternative approaches should be considered in difficult situations. In this study, no complications were observed during blade tip elevation. Compared with the Macintosh laryngoscope, no practical disadvantage were noted using this laryngoscope.

In conclusion, the McCoy levering laryngoscope improved laryngeal visualization in patients whose neck cannot be extended.

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