

Use of the McCoy shovel (laryngoscopy) in the management of the airway of an obese patient.

Alberto Labrada Despaigne, MD, PhD. Anesthesiology, Reanimation and Pain Management Clinic.

University Hospital "General Calixto Garcia". Havana. Cuba.

E-mail: albert@infomed.sld.cu

ORCID ID: <http://orcid.org/0000-0001-8719-4263>

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Summary:

Introduction. Obesity is an issue that alerts the anesthesiologist to the possibility of being in the presence of a patient with a possible difficult intubation.

Objective. To evaluate the use of the McCoy laryngoscope in the management of the airway of an obese patient scheduled for bariatric surgery.

Method. A descriptive cross-sectional study was performed in 105 obese adult patients scheduled for elective bariatric surgery under general orotracheal anesthesia. The following variables were submitted to analysis: age, sex, body mass index, mouth opening, mesh test, thyromentalian distance, cervical girth, Cormack-Lehane, and the number of intubation attempts using the McCoy or conventional laryngoscope.

Results. There were no differences between the groups based on the variables age, sex and BMI. The assessed predictive indices did not show differences with the degree of laryngoscopic vision in any of the groups except for the cervical circumference. Fewer number of intubation attempts with the McCoy laryngoscope were achieved.

Conclusions. The use of the McCoy laryngoscope in the obese patient's airway approach was superior to the use of the conventional laryngoscope, as it allowed fewer attempts to intubation. The factor that was most directly related to the degree of laryngoscopic vision was a cervical circumference greater than 50 cm, but with the use of the McCoy laryngoscope, the laryngoscopic vision was better..

Keywords:

- McCoy laryngoscope
- Airway
- Obesity
- Difficult intubation

Introduction

The population changes that overweight and obesity have generated worldwide since the second half of the 20th century (1), justify a change in the work of the anesthesiologist who faces patients with these characteristics. Multiple approaches from the perioperative point of view are necessary, especially in airway instrumentation (2).

Different authors, over time, have argued that patients with morbid obesity generally have difficult mask ventilation, laryngoscopy, and intubation. Obese patients have short necks, restricted mouth openings with large tongues and / or superfluous folds of oropharyngeal tissue, fatty infiltration of soft parts (pharynx and periglottic), presence of double chins, large breasts and cervical, presternal and posterior fat deposits, a more frequent anterior larynx than among the normal weight population, decreased cervical mobility, and a cervical circumference augmentation, which can make intubation difficult (3-5).

Routine airway evaluation is one of the key elements in reducing the morbidity and mortality associated with control when it is difficult; for this reason, the Difficult Airways Society (DAS) defines a difficult airway (VAD) as a situation where a conventionally trained anesthesiologist

experiences difficulty with the facial mask ventilation, the orotracheal intubation, or both. While a difficult laryngoscopy (LD) occurs when it is not possible to see the vocal cords with a conventional laryngoscope (grade III - IV laryngoscopy) the difficult intubation (ID) occurs when, there are three or more intubation attempts or more than 10 minutes (6) are required.

According to different reports around the world, many consider that obese patients are difficult to be ventilated and intubated, and that this issue is accentuated by a higher body mass index (BMI) and that it comes to represent 20.2% of a predictive value of complex intubation compared to patients with normal BMI (7, 8).

In the last decade the use of video laryngoscopes (VL) has been considered first line in the management of the airway of the obese patient (9).

Hoshijima and collaborators (10) report the results of a meta-analysis comparing the use of the video laryngoscopy with traditional Macintosh shovel direct laryngoscopy (LD) in obese adult patients. These authors report improvements in the visualization of the glottis, in the number of intubation attempts, and successful intubation when using the video laryngoscope to intubate the trachea. The results of this meta-analysis, together



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with those of a recent Cochrane review of video laryngoscopy in the general adult population, was performed by Lewis et al. (11), it argues that there is a better visualization and decrease in difficulty for intubation with the use of video laryngoscopes.

However, despite these advantages, general evidence to support the use routine VL in obese patients is scarce, although few clinical trials have been conducted; no definitive study has shown a clear superiority for a routinary use.

Like the meta-analysis, mentioned above by Lewis et al.(11) in the non-obese adult population, Hoshijima et al. (10) found better degrees of glottic visualization and overall success rates, but there was not enough evidence to suggest an improvement for a successful tracheal intubation. Contrary to the Lewis study, a lower general quality of evidence was observed in this study, and it was rated as very low for glottic visualization and for successful intubation and also for low success rates when comparing VL with LD using the Macintosh shovel, as you would expect from a more restricted population with fewer included studies and patients.

Most reports of difficult intubation in obese patients refer to the use of the traditional laryngoscope (Macintosh), with an incidence of laryngoscopy three to 10 times more complex than in normal-weight patients, generating, in some cases, iatrogenic lesions in the airway (12,13.) However, there are other instruments to approach it that are less traumatic, such as the McCoy shovel laryngoscope - consisting of a curved blade with a tips wing arm that allows a greater upward movement of the epiglottis - with better glottis display. Its use in cases of an anatomically difficult airway (VRAD), could decrease possible dental injuries, lacerations in the mucosa, edema and bleeding among others (14).

The difficulty in intubating the obese patient is variable and its incidence depends on the experience of the professional in charge and, on some occasions, on the instrument used (15,16.)

Intubation by direct laryngoscopy in morbidly obese patients may require aid that includes the use of stiletos, external laryngeal manipulation and shovel laryngoscopes of various types and sizes. However, direct laryngoscopy continues being the technique normally used to intubate obese patients, especially when video laryngoscopes are not available, as in our environment and many other countries where, due to economic reasons, do not have this technology.

Due to the increase in the obese population worldwide, each year more obese patients are drawn on to health institutions to undergo surgery. In this regard, the importance lies on knowing the alternatives available in most of the health institutions that can take care of this type of patients, either for bariatric surgery or for any other type of surgical intervention, and when lacking the resources for it. The objective of this investigation was to evaluate the use of the McCoy shovel against the Macintosh in the management of the airway of the obese patient who underwent laparoscopic bariatric surgery.

Methods

A descriptive, prospective, cross-sectional study was performed in 105 obese patients with BMI ≥ 30 , older than

19 years, of either sex, with physical status ASA I to III, who gave their written consent, scheduled for vertical gastro plication laparoscopic surgery under general orotracheal anesthesia at the "General University Hospital Calixto Garcia" from January 2017 to January 2019. Patients with anatomic facial and / or neck deformities, those who did not cooperate with the physical examination, patients with a known background of a complex airway, and pregnant were all excluded. Two groups were formed in a simple random way: Macintosh group: 52 patients and McCoy group: 53 patients.

Variables: The variables studied included: age, sex, BMI (categorized into five degrees according to the classification of the Spanish Society for Obesity Surgery - SECO), mouth opening (stratified into four classes: I- more than 3 cm, II- 2.6 to 3 cm, III- from 2 to 2.5 cm and IV- less than 2 cm), Mallampati test, thyromental distance, cervical circumference, Cormack and Lehane test and number of intubation attempts.

All patients were subject to a pre-anesthetic evaluation on the part of the specialized staff where difficult airway predictive tests were applied as part of the clinical evaluation (Mallampati degree, thyromental distance, mouth opening and cervical circumference). Once in the operating room, the patient was placed in ramp position, which provides a higher quality laryngoscopic view for the insertion of an orotracheal tube under direct vision. Upon completion of the induction and reaching the anesthetic stage suitable for intubation, the direct laryngoscopy was performed with the conventional laryngoscope (Macintosh blade) or McCoy blade according to the study group and the degree of laryngoscopic vision was evaluated according to the Cormack and Lehane classification and the difficulty in intubation by the number of attempts to intubate the windpipe.

Statistic processing techniques: I include the calculation of summary measures for qualitative and quantitative variables, absolute frequencies, and percentages. For the identification of significant differences in the results obtained between the two groups, the Pearson's Chi square test (X^2) with a level of significance 95% ($\alpha = 0.05$).

Ethical considerations: The research was analyzed and approved by the Scientific Council and the Institutional Ethics Committee. All patients provided informed consent. The ethical principles found in the Declaration of Helsinki and the International Standards for Biomedical Research in Human Beings were taken into consideration. Anonymity, the scientific use of the obtained information and adequate use of the data were guaranteed. All interventions were performed within the anesthesia procedures protocols established for that purpose.

Results

Most patients were within the age range between 40 to 49 years, with a total of 43 patients (40.9%) and the same distribution between the two groups, without significant differences between them ($p = 0.769$). The average age of all was 39.3 ± 8.6 years, similar to the average of the groups. There was a predominance of the female sex over the male represented by 75 women and 30 men, 71.4%, and 28.6%, of the total respectively. Both groups behaved with equal predominance of the female sex, without significant differences among them ($p = 0.376$).

Regarding the degree of obesity represented by BMI, the obese patients grade III predominated in 62% (65 patients) of all and between the two groups.

These general characteristics of the studied patients are presented in Table 1, which highlights the fact that there was no significant difference in any of the evaluated variables, and which shows the homogeneity of the groups.

Variables	Macintosh	McCoy	P
N	52	53	
Age (years)*	39,5 ± 9,5	39,2 ± 9,7	0,769
Gender			
Female	36 (34,3%)	39 (37,1%)	0,376
Male	16 (15,2%)	14 (13,4%)	
Categorized IMC			
Degree I (30 – 34,9)	3 (5,8%)	4 (7,6%)	0,670 a
Degree II (35 – 39,9)	7 (13,5%)	8 (15,1%)	
Degree III (40,0 – 49,9)	32 (61,5%)	33 (62,2%)	
Degree IV (50,0 – 59,9)	10 (19,2%)	8 (15,1%)	
Degree V (≥ 60)	0 (0,0%)	0 (0,0%)	

Source: Medical records

* average and DS

a Bartholomew’s chi-square test (X²)

Table 1. Distribution of patients according to general characteristics of both groups.

The relationship between the Mallampati test and the Cormack-Lehane grade is observed in Figure 1. Most of the patients in the two groups had Mallampati degrees. Low (I / II); 69.2% in the Macintosh group (grade I: 26, grade II: 10) and 75.4% in the McCoy group (grade I: 24, grade II: 16). When analyzing the correspondence between the two tests, this was greater with the use of the McCoy shovel, although without significant differences relative to the other group.

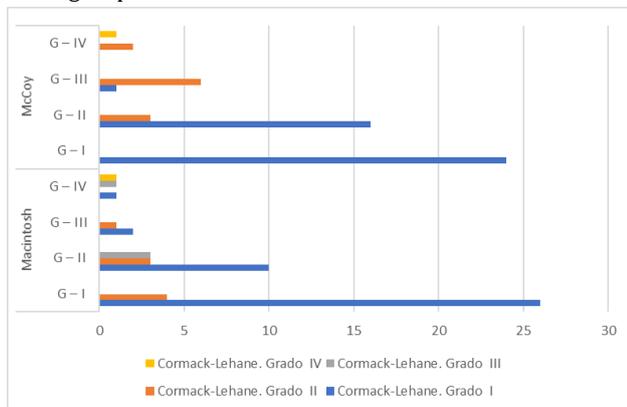


Figure 1. Distribution of patients according to the Mallampati test and Cormack-Lehane grade.

When the mouth opening was related to the Cormack-Lehane degree, it was observed that most patients had a mouth opening greater than 3 cm in both groups. (Macintosh: 38 patients and McCoy: 41 patients). Despite this, when performing direct laryngoscopy with the Macintosh blade, six cases were observed with a grade III / IV Cormack-Lehane, while in the group that used the McCoy, all patients had a Cormack-Lehane grade I / II. There was no patient with mouth opening less than 2 cm.

Mouth opening	Degree I	Degree II	Degree III	Degree IV
Macintosh Class I	38	7	3	0
Class II	1	0	1	1
Class III	0	0	0	1
Class IV	0	0	0	0
McCoy	41	9	0	0
Class I				
Class II	2	0	0	0
Class III	0	1	0	0
Class IV	0	0	0	0

Source: Medical records

Table 2. Distribution of patients according to mouth opening and Cormack-Lehane grade.

Table 3 shows the relationship between cervical circumference and Cormack-Lehane grade. It was found that when exceeding 50 cm, the visualization of the glottis with the Macintosh blade is difficult, which was corroborated in all cases with a grade III / IV Cormack-Lehane, while the group where the McCoy laryngoscope was used was Although the cervical circumference exceeded 50 cm, the Cormack-Lehane degree it was I / II, a significantly lower result (p = 0.001).

Cervical circumference (cm)	Cormack-Lehane			
	Degree I	Degree II	Degree III	Degree IV
Macintosh				
< 40	5	6	0	0
40-49	12	9	8	4
>50	0	0	2	6
McCoy *				
< 40	13	1	0	0
40-49	24	6	2	0
>50	4	3	0	0

Source: Medical records * p = 0,001

Table 3. Relationship between cervical circumference and Cormack-Lehane degree.

When analyzing the relationship between the thyromental distance and the Cormack-Lehane degree, most of the patients in the two groups had a thyromental distance greater than 6.5 cm (Macintosh: 45 patients / 86.5%, McCoy: 36 patients / 67.9%), a Despite this, when performing direct laryngoscopy with the McCoy shovel, two cases with a grade III Cormack-Lehane, while with the use of the Macintosh shovel patients with a grade III / IV Cormack-Lehane were not observed. There was also significant differences between both groups.

When the number of attempts for orotracheal intubation was analyzed according to the groups, it was observed that four patients with the Macintosh shovel required a second attempt and two patients required up to a third attempt of intubation: while in the patients in which the McCoy shovel was used, all were intubated at first attempt, which was significantly less. (p = 0.04).

Number of Attempts	Macintosh		McCoy		Total	
	No.	%	No.	%	No.	%
1	46	43.8	53	50.5	99	94.2
2	4	3.8	0.0	0.0	4	3.9
3	2	1.9	0.0	0.0	2	1.9

Source: Medical records * p = 0,04

Table 4. Number of attempts for orotracheal intubation by group.

Discussion

The association between difficult intubation and obesity has been a subject of constant debate. Morbid obesity is usually recognized as one of the risk factors from VRAD. Visual alignment of the oral, pharyngeal, and laryngeal axes is challenging because of

to a series of anatomical alterations described above, some of may not be detectable with the physical or functional examination of the same, and lead to a difficult airway (4,5). However, the actual incidence and degree of difficulty are not clearly documented.

According to obesity statistics, of every four obese, three are women, and of morbidly obese patients who come, of necessity or will, to a operating room, in most of the series it was found that the female sex predominates, same as in this series (17). Regarding the age variable, they were not relevant significant and coincide with studies carried out in the Cuban population by Echevarria Hernández and Rodríguez Bonet (18,19).

Prediction of intubation difficulty is limited in both patients with Morbid obesity as without it, according to some authors is the classification of Mallampati the best predictive factor in obese patients, with a high specificity that slightly improves in its variant with cervical extension, but with low sensitivity (4).

In this investigation, the Mallampati test had a proportional relationship between the grades I and II with the best grades of laryngoscopic vision, and a better relationship with the use of the McCoy shovel, although without significant deference with the conventional laryngoscope.

The measurement of neck circumference has been considered predictive of difficulty in intubation from values greater than 50 cm (20). In this series it was observed that with the use of the Macintosh shovel, the behavior was similar to that reported in the literature, with greater difficulty for glottic vision according to the Cormack Lehane scale. However, when using the McCoy shovel, this difficulty was minimal, with significant differences.

The neck circumference is related to weight, male sex, and amount of cervical fat, all factors that can influence the difficulty for intubation, although the quantification of cervical soft tissue measured by ultrasound has not been correlated with this difficulty (20,21).

Neck circumference is also associated with a higher prevalence of obstructive sleep apnea syndrome, this syndrome depends not only on cervical fat but on its anatomical ratio with bone structure, this would explain the controversies regarding the predictive value of difficulty in the intubation that these patients can present (21).

Alanis Uribe and collaborators (22), carried out an experimental, randomized study, prospective, transversal, in obese patients scheduled for elective surgery. Ninety patients studied to correlate neck circumference with difficulty for intubation, by direct laryngoscopy, and they used a laryngoscope conventional. The total number of patients who presented difficulty for intubation were 16, six of them corresponded to a neck circumference equal to or greater than 45 cm, and of them one male patient could not be intubated. Despite this, they consider that CC is not an exact predictor of intubation difficulty.

Riad W and collaborators (20), reported that a BMI greater than 50 kg / m², with a neck circumference greater than 42 centimeters, are independent predictors of difficult intubation. However, in their research they do not associate it with a possible VRAD.

In a patient with morbid obesity, obtaining a good vision of the glottis and time required to intubate, are of utmost importance, given their limited capacity functional residual and shorter desaturation times. However, I still don't know the best laryngoscope to achieve this goal.

In the reviewed literature, there was little research comparing the use of the McCoy shovel with other types of laryngoscopes. One of the studies that does it, is the carried out by Akbarzadeh SR and collaborators (23). They carried out a randomized clinical trial in 102 obese patients with a BMI greater than 30 kg / m², which they divided into three groups, according to the use of the Macintosh, McCoy or GlideScope. They related the Mallampati test, the thyromental distance and the cervical circumference with the time of laryngoscopy, the Cormack-Lehane scale and the percentage of glottic opening, then They found that the glottis opening percentage was higher and more appropriate with the McCoy laryngoscope. The laryngoscopy time and the Cormack-Lehane scale they were better with the GlideScope video laryngoscope. These results are similar to those observed in the patient series of the present investigation.

On his part, Nandakumar KP et al. (24), in another randomized clinical trial in 45 patients with morbid obesity, likewise compared the Macintosh laryngoscope, McCoy and the Glidescope. The authors found that the time required for intubation was longer with the GlideScope compared to laryngoscopes Macintosh and McCoy, while in the latter there were no significant differences in times to intubate the trachea. However, the Cormack-Lehane grade was comparable between the three groups. All patients in the Macintosh group and the group of the Glidescope had Cormack-Lehane grade 1 or 2, and only one patient in the group McCoy was grade 3, suggesting that although the video laryngoscope provided a good degree of glottic vision in obese patients, it took longer to achieve that vision. They also compared the number of intubation attempts and obtained more attempts even with Cormack-Lehane 1 and 2 when the Glidescope was used. They concluded that the Video laryngoscope did not provide advantages over difficult intubation, while the use McCoy's was as effective as the Macintosh.

These findings are consistent with those of Sun DA et al. (25), in another trial randomized clinician in 200 patients, who also experienced more attempts to intubation, even with Cormack-Lehane 1 and 2 when the Glidescope was used.

Another of the advantages attributed to the McCoy shovel is protection against hemodynamic changes during laryngoscopy and intubation. Aggarwal H and collaborators (26), performed a randomized, double-blind study in 150 patients with normal airways under elective general anesthesia and compared the C-MAC video laryngoscope with the McCoy and Macintosh. They found that the McCoy laryngoscope provided better attenuation of responses hemodynamics at laryngoscopy and intubation than the C-MAC video laryngoscope and Macintosh blade ($p = 0.001$), while a greater visualization of the glottis with the C-MAC video laryngoscope. However, the time necessary to carry out endotracheal intubation was the longest with the latter.

In this investigation, despite the fact that the degree of hemodynamic response to laryngoscopy and intubation was not evaluated, it was appreciated that the use of the McCoy provided greater ease to intubate the trachea in the obese population studied, since in all cases it was performed in a first attempt.

The increased incidence of difficult intubation may also be secondary to operator variability and years of experience in clinical specialty studies that cannot range within such a broad range.

In this case all the patients were treated by the author of the investigation with an experience of more than 20 years trying obese patients, so this may have influenced the results that were obtained.

In conclusion, the use of the McCoy laryngoscope to approach the airway of the obese patient was a safe alternative to using the Macintosh laryngoscope, under the working conditions of the institution hosting the research, as it allows a fewer intubation attempts.

The factor that was most directly related to the degree of laryngoscopic vision was a cervical circumference greater than 50 cm, but with the use of the McCoy shovel, vision laryngoscopy was better.

Limitations of the study

No comparisons could be made with any type of video laryngoscope for not having them in the institution. Other of the limitations was that the time required to intubate the trachea was not evaluated with one shovel or another, as it was only limited to the number of attempts. Not included patients with a known history of a difficult airway, nor a BMI equal to or greater than 60 Kg / m².

Conflicts of interest

None.

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