The usefulness of the laryngeal mask compared to that of endotracheal tube in anesthesia for mastectomy

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SUMMARY

Objective: We compared the usefulness of the laryngeal mask airway (LMA) vs. the endotracheal tube (ETT) for the management of the upper respiratory tract in patients subjected to mastectomy. Material and methods: It was studied a total amount of 207 patients subjected to modified radical mastectomy, with a physical condition ranging from ASA I to III. The patients were divided into two groups: Group I, LMA, 104 patients and Group II, ETT, 103 patients. Both groups were managed through general anesthesia balanced with sevoflurane, fentanyl, and vecuronium. The ventilation was kept by a semi-closed circuit with controlled mechanical ventilation. Results from the 104 patients of the Group I (LMA): in 7 patients the placing of the LM was very difficult, and it was impossible in another one, due to escapes in ventilation. Therefore, it was necessary to practice tracheal intubation; the pharyngeal pain was present in the 10% of the patients. In the Group II (ETT), with 103 patients, intubation was found difficult in 17 patients, and it was necessary to use fibrolaryngoscopy in 2 of the patients; pharynx pain was present in the 55% of the patients (p < 0.05). In the ETT placing, it was found an increase in cardiac frequency with a significant statistical difference (p < 0.05). The medicine (drugs) consumption was lower for the LMA Group with a significant statistical difference for vecuronium (p < 0.05). Conclusion: The use of LMA in patients subjected to mastectomy is safe and useful. It presents advantages over ETT. We noticed a great usefulness in the use of LMA in this kind of surgeries, where the complication possibility is reduced to a minimum and the patients go home with fewer problems in the upper respiratory tract.

Key words: Laryngeal mask, endotracheal tube, mastectomy.

RESUMEN

Objetivo: Comparamos la utilidad de la mascarilla laríngea (ML) vs tubo endotraqueal (TE) para el manejo de la vía aérea en pacientes sometidas a mastectomía. Material y métodos: Se estudiaron un total de 207 pacientes sometidas a mastectomía radical modificada, con estado físico del ASA I a III, divididas en dos grupos: el grupo I: ML 104 pacientes y el grupo II: TE 103 pacientes. Ambos grupos fueron manejados con anestesia general balanceada con sevoflurano, fentanilo y vecuronio. La ventilación fue mantenida con circuito semi-cerrado con ventilación mecánica controlada. Resultados de las 104 pacientes del grupo I (ML): en 7 fue difícil la colocación y en una imposible, por fuga durante la ventilación, por lo que fue necesario la intubación traqueal; el dolor en la faringe se presentó en el 10% de las pacientes. En el grupo II (TE) 103 pacientes, se encontró dificultad para la intubación en 17 pacientes, entre las cuales en 2 fue necesario utilizar fibrolaringoscopia; el dolor en la faringe se
presented in the 55% of the patients \( (p < 0.05) \). In the location of TE we encountered an increase in the frequency cardiacon with difference statistically significant \( (p < 0.05) \). The consumption of medicines was less in the group of ML with statistically insignificative for the vecuronio \( (p < 0.05) \). Conclusion: The use of the ML in patients sometted to mastectomy is utíl and secure, presents advantages over the TE, notamos una gran utilidad en el uso de la ML en este tipo de cirugías, en donde la probabilidad de complicación es mínima y las pacientes se van a su domicilio con menos molestias por el manejo de vía aérea.

Palabras clave: Mascarilla laríngea, tubo endotraqueal, mastectomía.
cuff, because its spread was transforming this cuff into a high-pressure cuff; forcing developing a gas-tight cuff, it was developed by Fujiwara. In 1967, Murphy, using a fiberoptic endoscope, performed the first intubation, this starts with the era of fiberoptic bronchoscopy(5).

Currently, and considering the vast amount of literature on the subject, it is known that many researchers have suggested that the LMA offers enormous advantages over the ETT, specially in short to middle duration procedures(6). The objective of this study was to determine the efficacy and usefulness of the laryngeal mask airway (LMA) as an method alternative to the use of endotracheal intubation (EI) in anesthetic and surgical procedures for mastectomy, and to determine the difficulty of positioning each one of these devices, as well as to study the changes in oxygen saturation, capnography, airway pressure, hearth rate and blood pressure during ventilation with LMA and EI. Other objective was to describe the benefits and pitfalls of the placement of both devices, to see if there was any advantage between the use of one or another for the protection of the airway in patients undergoing general anesthesia, to assess pain in the larynx and to see if there is difference in regard to the occurrence of nausea and vomiting in the postoperative period in patients undergoing mastectomy at the Hospital de Oncología del CMN Siglo XXI from IMSS.

**MATERIAL AND METHODS**

A study was conducted by three anesthesiologists with minimum 5 years experience in anesthesiology, with the authorization of the protocol by the Research Ethics Committee of the hospital, over in the period January 2003 to April 2005, in which 215 patients were studied. They were divided into two groups: Group 1, laryngeal mask airway (LMA); and Group 2, endotracheal tube (ETT). Classic non-disposable sizes 3, 4, 5 LMA according to the needs and No. 7.0, 7.5, 8.0 and 8.5 tubes according to each patient were used. It is a prospective longitudinal study. Inclusion criteria were: 1) patients with ASA physical status I-III; 2) patients of any age and gender who will undergo an elective mastectomy; and 3) patients who have agreed to enter the studio. The exclusion criteria were: 1) patients with deformities of the oral cavity or pharynx; 2) patients with a full stomach; 3) morbidly obese patients; and 4) patients who have not agreed to enter the studio. The elimination criteria were: 1) all patients who have to be reintubated or relocated the laryngeal mask in the postoperative period for any reason. All patients were monitored through ECG, pulse oximeter, capnograph, non-invasive blood pressure, inhaled and exhaled gas analyzer. Medication previous to induction with 0.02 to 0.03 mg/kg midazolam. Induction with 1.5 to 2 mg/kg propofol, 0.005 to 0.005 mg/kg fentanyl, 0.05 to 0.1 mg/kg vecuronium. Maintenance on mechanical ventilation, with 5-7 mL/kg CV and Risk Factor (RF) 10x’, with 100% oxygen and sevoflurane in volumes percent according to needs of each patient and bolus fentanyl, 8 mg ondansetron and NSAIDs as an analgesics for postoperative period. It took into account the ease of placement of LMA or ETT, how many attempts were made if there was need to change the technique, at the first try was considered easy, at the second attempt was considered more difficult and at third attempt was considered impossible. BP and HR were taken every minute during induction and were taken every 5 min after placement of LMA or ETT. The difficulty and complications of ventilation, pulse oximetry and capnography in transanesthetic period, the emergence of anesthesia were registered, and finally postoperative nausea and vomiting and laryngeal pain were analyzed, comparing both groups.

**RESULTS**

Of the 215 patients underwent mastectomy who entered the study, 8 patients were removed because they again underwent surgery by hematoma in the immediate postoperative period. There were 104 female patients in Group 1 (LMA), with an average age of 54.6 ± 16.3 years and an average weight of 64.8 ± 8.8 kg. ASA physical status grade I: 23 patients; grade II: 74 patients; grade III: 7 patients. There were 103 patients in Group 2 (ETT), 102 woman and 1 man. With an average age of 53.4 ± 15.9 years and an average weight of 65.3 ± 8.3 kg (Table I). ASA physical status grade I: 19 patients; grade II: 76 patients; grade III: 8 patients. No statistically significant difference was found in both groups (Table II). Of the 104 patients in Group 1 (LMA), placement was very easy in 96 patients, it was difficult in 7 patients, and LMA can not be placed properly in 1 patients, there

<table>
<thead>
<tr>
<th>Table I. Demographic variables in each group.</th>
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<tbody>
<tr>
<td>Group 1 LMA</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Weight (kg)</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Table II. ASA physical status in each group.</th>
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<tr>
<td>Group 1 LMA patients</td>
</tr>
<tr>
<td>ASA I</td>
</tr>
<tr>
<td>ASA II</td>
</tr>
<tr>
<td>ASA III</td>
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was air leakage during ventilation, so this patient had to be intubated (Figure 1). No. 3 LMA was used more frequently (Table III). There was no difficulty in handling of the ventilation, graph was normal in the capnography, expiratory CO₂ (29 ± 3 mmHg) was handled properly, pulse oximetry was always above 98%. Of 103 patients in Group 2 (ETT), intubation was easy in 86 patients, it was difficult in 15 patients, and it was impossible by traditional laryngoscopy in 2 patients, so it was done using fiberscope with no complications. The No. 7.5 endotracheal tube was the one most used (Table IV). During mechanical ventilation, in the capnography, in handling of expiratory CO₂ (28 ± 4 mmHg) and pulse oximetry was above 98% in all patients.

With regards to the use of drugs, in the LMA group this use was lower, 1.7 mg/kg propofol were administrated in LMA group as compared to 2.2 mg/kg fentanyl in ETT group. Moreover, total consumption was lower in the LMA group, 1.8 mg/kg sevoflurane were administrated in LMA group as compared to 2.6 mg/kg in ETT group, 1.0 MAC was administrated in LMA group and 1.1 MAC in ETT group; there was no statistic significance in these parameters. Average dose of vecuronium bromide was 0.04 mg/kg in LMA group and 0.08 mg/kg in ETT group as single dose during induction in both groups with p <0.05 statistically significant (Figure V).

In the hemodynamic parameters during the placement of both devices, the heart rate was 80 ± 7 beats per minute with a baseline of 72 ± 5 beats per minute in LMA group and it was 98 ± 8 beats per minute in ETT group with a baseline of 69 ± 6 beats per minute, p <0.05 statistically significant (Figure 2). The average systolic blood pressure was 135 ± 15 mmHg in LMA group with a baseline of 130 ± 20 mmHg and it was 145 ± 25 mmHg in ETT group with a baseline of

### Table III. Size of laryngeal mask used.

<table>
<thead>
<tr>
<th>Laryngeal mask</th>
<th>No. 3</th>
<th>No. 4</th>
<th>No. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of patients</td>
<td>87</td>
<td>17</td>
<td>0</td>
</tr>
</tbody>
</table>

### Table IV. Internal diameter of endotracheal tube.

<table>
<thead>
<tr>
<th>Endotracheal tube</th>
<th>No. 7.0</th>
<th>No. 7.5</th>
<th>8.0</th>
<th>8.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of patients</td>
<td>21</td>
<td>43</td>
<td>29</td>
<td>10</td>
</tr>
</tbody>
</table>

### Table V. Average consumption of medicines. Differences are found for fentanyl and vecuronium, was statistically significant for vecuronium, with p < 0.05.

<table>
<thead>
<tr>
<th></th>
<th>LMA</th>
<th>ETT</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl mg/kg</td>
<td>0.0018</td>
<td>0.0026</td>
<td>0.09</td>
</tr>
<tr>
<td>Vecuronium mg/kg</td>
<td>0.04</td>
<td>0.08</td>
<td>0.04</td>
</tr>
<tr>
<td>Sevoflurane CAM</td>
<td>1.0</td>
<td>1.1</td>
<td>0.95</td>
</tr>
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</table>
The diastolic arterial pressure was 88 ± 7 mmHg in LMA group with a basal of 83 ± 16 mmHg and it was 95 ± 13 in LMA group with a baseline of 80 ± 15 mmHg, although there were notable changes, there was no statistical significance (Figure 3). During the perioperative period, average heart rate was 68 ± 7 beats per minute in LMA group and it was 67 ± 7 beats per minute in LMA group; the average systolic pressure was 110 ± 7 mmHg in LMA group and it was 112 ± 5 mmHg in ETT group; the diastolic pressure was 62 ± 6 mmHg in LMA group and it was 58 ± 10 mmHg in ETT group without statistical significance (Figure 4). On the other hand, 21 patients of Group 1 had nausea and vom-

![Figure 2. Heart rate in beats per minute, basal and during placemnet of the LMA and intubation with ETT, with basal average of 72 for LMA and 69 for ETT, in the placement the average for LMA 80 and to ETT of 98. It was found significant statistically differences with p < 0.05.](image)

![Figure 3. Systolic and diastolic blood pressure in mmHg during placement of the LMA or intubation with ETT. Although there are fewer changes, in systolic blood pressure for LMA, basal 130 mmHg and placement 135 mmHg, for the ETT, basal 130 mmHg and placement 145 mmHg and diastolic, basal for LMA 83 mmHg, in the placement 88 mmHg, for the ETT basal 80 mmHg and the placement 95 mmHg. It was not found significant statistically differences.](image)
Figure 4. Systolic and dyastolic heart rate during intraoperative period. There were no differences in both groups, they both behaved in similar form without finding difficulties in the handling of these parameters. There were no significant statistical differences. LMA (laryngeal mask airway), ETT (endotracheal tube), S (systolic), D (dyastolic), HR (heart rate).

Figure 5. LMA was placed to 104 patients. In immediate postoperative (PO) presented pain 10 patients and 24 hours PO presented pain 6 patients. ETT of a total of 103 patients in the immediate PO 54 presented pain and 24 hours PO, 17 still had pain. Were found statistically significant differences, \( p < 0.05 \).

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symptom, there was statistically significant with p <0.05 (Figure 5). The surgical anesthetic time was 174 ± 16 minutes in group 1 (LMA) and it was 168 ± 20 minutes in group 2 (ETT).

STATISTICS
We obtained average values and standard deviations with a confidence interval of 95%. The observed differences were tested using the Friedman test and Wilcox paired test. Significance was assumed as P <0.05.

DISCUSSION
The use of LMA in breast surgery demonstrates the usefulness and safety with which it can be used in this type of surgery.

After carefully analyze this method and doing the procedure on a daily basis, we can establish that the LMA is a highly useful, secure and effective resource in managing airway and controlled mechanical ventilation(7-9). The ease of application was apparent in our patients, virtually in all cases like it has been reported in other great authors such as Verghese, who reported difficulties in only 0.24% in 11,910 cases. However, it is worth noting that in many cases the differences between authors depend on familiarity with the skill required for overcoming a real difficulty in the emergency management of the airway in the areas of Emergency, Intensive Care Units and cardiac arrest units(10).

In our study, the observed criterion on the application form was as following: LMA with partial balloon inflation and good lubrication was placed in all patients, no difficulties were found in implementation as it has been reported above(11,12). It is worth mentioning that, in our protocol, the muscle relaxant was used in minimal doses, further facilitating ventilation and placement of the LMA, contrasting with the most of the publications reported. However, we believe that can do without muscle relaxants for the placement of the LMA(12).

Mechanical ventilation was established in all cases and no air leak was noted with positive pressure (20 cm of water or less).

Regarding the possibility of gastric aspiration, we always used LMA in patients with short time and we had no evidence of regurgitation in any patient. In large analyses as that of Brimacombe and Berry, the incidence of pulmonary aspiration of gastric contents with a frequency of 2/10, 000 is indicated(13).

Although there have been no reported cases of laryngospasm, we never have seen, although we do not use atropine routinely.

Capnography was normal in all patients and CO₂ could be handled adequately at the end of expiration; the oxygen saturation in all patients remained above 98%(14).

It is worth considering that the mask’s cuff was never deflated, making insertion and removal without complications. The only side effects encountered and eventually reported in the literature were: mild pain of the larynx (10% of cases) and occasionally blood streaked mask, which is unrelated to pain.

It is particularly worth considering that irrespective of the fields where the laryngeal mask can be used, there are indications virtually absolute such as very difficult laryngoscopy, both for patient characteristics and aggregate pathology. In this sense, the traumatic cervical injury occupies a prominent place as many accidents have occurred on maneuvers in the laryngoscopy and intubation, being able to cause more damage than already exists at the spinal level(17,18). It is now recognized as an irreplaceable resource in the emergency management of the airway in the areas of Emergency, Intensive Care Units and cardiac arrest units(10,20).

CONCLUSIONS
We believe it should be used virtually daily in breast surgery scheduled, with which the anesthesiologist will obtain the skills required for overcoming a real difficulty in the airway approach, thus obtaining an atraumatic handling of this situation. At the same time, the LMA is useful, safe and reliable to maintain adequate mechanical ventilation.

One of the major advantages that we found with the implementation of the LMA is that there is no sympathetic-adrenergic stimulation as in the case of the ETT, a significant event in patients with limited cardiac reserve, vital signs remained unchanged at onset and during the procedure.

Laryngeal pain is minimal after the emplacement of LMA, so the patients go to their homes more comfortable and with minimal discomfort by the management of the airway. We believe that the LMA should be used as the first choice for patients with breast cancer who will undergo an elective mastectomy and have no contraindication to the use of it.

REFERENCES


