ANESTHESIOLOGY

Complications of using laryngeal mask airway during anaesthesia in patients undergoing major ear surgery

Complicanze dell'uso della maschera laringea in pazienti sottoposti ad interventi di chirurgia dell'orecchio

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SUMMARY

Use of the laryngoscope and tracheal tube during general anaesthesia results in many complications such as sore throat, cough, vocal cord paralysis, compulsory injection of muscle relaxants for tube insertion and risky emergence of anaesthesia. This study investigated the use of laryngeal mask airway (LMA) as a safe and complication-free device in patients undergoing ear surgery. This is a retrospective cross-sectional study on a population comprising patients from 3 to 70 years of age who have undergone major ear surgery, in Amir Alam Hospital, from 1999 to 2006. Laryngeal mask airway replaced the tracheal tube in all patients. Of the 2000 patients who underwent major ear surgery with general anaesthesia using LMA, 246 (12.3%) developed haemodynamic instability. A significant relationship was observed between age and haemodynamic instability (p value = 0.03); 14.9% of these patients were aged between 16 and 40 years and 20% were aged > 60 years. No relationship was observed between the occurrence of this complication and duration of surgery (p value = 0.2). Furthermore, no significant relationship was observed between sex and haemodynamic instability. In conclusion, considering the low rate of complications with laryngeal mask airway, replacing tracheal tube with this device in major ear surgery will lead to a noticeable decrease in associated complications.

KEY WORDS: Major ear surgery • General anaesthesia • Laryngeal mask airway

RIASSUNTO

L'utilizzazione dell'intubazione endotracheale nel corso dell'anestesia generale può essere accompagnata da diverse complicazioni quali faringodinia, tosse, paralisi delle corde vocali, necessità di somministrazione di miorilassanti per l'inserzione del tubo, ed emergenze respiratorie. Questo studio indaga l'efficacia dell'utilizzo della maschera laringea, come strumento valido e privo di complicazioni in pazienti sottoposti a chirurgia dell'orecchio. Si tratta di uno studio retrospettivo che comprende i pazienti, di età compresa tra i 3 e i 70 anni, sottoposti a chirurgia dell'orecchio presso l'Amir Alam Hospital tra il 1999 e il 2006. In tutti questi pazienti è stata utilizzata la maschera laringea al posto dell'intubazione endotracheale. Dei 2000 pazienti sottoposti a chirurgia dell'orecchio in anestesia generale con maschera laringea, 246 (12,3%) hanno presentato instabilità emodinamica. Una relazione significativa è stata osservata tra età e instabilità emodinamica (p = 0,03); il 14,9% di questi pazienti presentava un'età compresa tra i 16 e i 40 anni, mentre il 20% presentava età > 60 anni. Nessun rapporto è stato invece osservato tra l'insorgenza di complicanze e la durata dell'intervento chirurgico (p = 0,2). Inoltre, non è stata evidenziata una relazione statisticamente significativa tra l'insorgenza di complicanze e il sesso. In conclusione considerando la bassa incidenza di complicanze con l'utilizzo di maschera laringea, la sostituzione dell'intubazione oro-tracheale con questa metodica nella chirurgia dell'orecchio potrebbe ridurre le complicanze associate all'anestesia.

PAROLE CHIAVE: *Chirurgia dell'orecchio • Anestesia generale • Maschera laringea*

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Introduction

Use of the laryngoscope and tracheal tube during general anaesthesia is accompanied by many complications such as sore throat, cough, nausea, laryngospasm, arytenoid dislocation, vocal cord paralysis, compulsory injection of muscle relaxants for tube insertion and possibly risky emergence at the end of anaesthesia. Laryngeal Mask Airway (LMA) provides a reliable airway during general anaesthesia without serious complications or need for muscle relaxants for insertion, and may thus be considered a suitable alternative for tracheal tube. In major ear surgeries, where injection of muscle relaxants is prohibited, it seems logical, in order to retain the functionality of the

seventh cranial nerve, to make use of LMA and the technique of spontaneous breathing for general anaesthesia under capnograph monitoring.

Duff [1], in a 1999 issue of *The Laryngoscope,* reported the use of LMA in 100 cases undergoing general anaesthesia for major ear surgery which included 24 tympanoplasty, 55 tympanoplasty with mastoidectomy, 5 canaloplasty, and 2 ear atresia repairs. No cases of gastric regurgitation were reported with the exception of one case of regurgitation without aspiration immediately prior to LMA extraction. Overall, 3 patients complained of sore throat after surgery during recovery, but their complaints improved after 24 hours. No cases of hoarseness, dysphagia, laryngospasm or nausea were observed. In one case, surgery was interrupted due to patient's movement during the operation. In conclusion, the Author reported LMA to be a safe airway device during general anaesthesia in patients undergoing major ear surgery, requiring no muscle relaxant for insertion and involving considerably fewer complications.

Ates et al. [2], in 1998, reported 94 cases of LMA in general anaesthesia for eye surgery, including 37 cases of strabismus surgery, 21 cases of congenital cataract surgery, 15 cases of palpebral surgery, 9 cases of ophthalmectomy, 7 cases of sclera suture removal, and 5 cases of trabeculotomy. Among these patients, LMA insertion failed in 2 cases; 3 cases developed laryngospasm at the beginning of anaesthesia; one case developed bucking at the beginning of anaesthesia. After extraction of LMA, 5 cases developed laryngospasm and 21 cases had apnoea, while one patient complained of a sore throat on the first day after surgery. Cardiovascular instability was minimal during LMA insertion. Ates et al. reported LMA to be a safe airway during deep general anaesthesia in patients undergoing eye surgery, with insignificant cardiovascular instability and complications.

The aim of the present study was to investigate the possible complications with the application of LMA in patients undergoing ear surgery.

Method

This is a retrospective cross-sectional study on 2000 patients (age range 3-70 years) submitted to major ear surgery with LMA, under general anaesthesia. in Amir Alam Hospital from 1999 to 2006.

Laryngospasm, nausea, vomiting, arytenoid dislocation, vocal cord paralysis, sore throat, and cough were considered as complications of using LMA. The medical files of those patients undergoing surgery were evaluated and those cases operated on with LMA were identified. All corresponding data were collected according to the questionnaire.

Due to the low frequency of complications, easy access to medical files and data collection, all patients, 3-70 years old, who had been submitted to surgery with LMA were included in the study.

The patients' data were collected from different sources, such as the operating theatre registry and the list of patients in admission, and these were compared with the data in their medical files.

The data collected were analyzed using methods of descriptive statistics. For analysis, the quantitative variables were studied using Student's T test. Comparison of qualitative variables was achieved using χ^2 and, in some cases, Fisher's Exact test.

Results

Out of the 2000 patients under study, 1160 (58%) were male and 840 (42%) female. Of these, 512 were aged < 15 years and 1488 were > 15 years (Table I). The mean age of patients was 28 years and 18 days (with standard deviation [SD] of 17 years and 3 days).

The most frequent indication of surgery was tympanoplasty. All patients had ASA scores of I or II.

Induction of anesthesia for all patients was performed by propofol, phentanyl, midazolam, isoflurane and N_2O. The laryngeal mask was applied in 99.85% of patients without any trouble or trauma; for one patient, it was inserted at the second, and in two patients at the third attempt. All patients were set up for spontaneous respiration and no case of hypoxaemia (saturation < 95%) was observed.

LMA was dislocated only in 20 patients (1%) (during head rotation to expose the site of surgical incision). No patient required tracheal intubation (Table I).

The mean duration of surgery was 3 hours and 28 minutes, range 30 minutes-8 hours (SD: 1 hour and 26 minutes).

Surgery was witheld, in 10 patients, for < 5 minutes due to noisy respiration which resembled inspirational stridor. Injection of 50 mg propofol and increasing the percentage of isoflurane eliminated the noise.

Moving the patient's head, which occurs frequently in major ear surgery, particularly during incision dressing, did not cause cough or vomiting, in any of the patients.

Gastric distension was not observed in any patient. Although regurgitation was observed in 5 patients (0.25%), immediately after extraction of the LMA, the gastric content was not observed in their LMA lumen and no patient had tracheal aspiration (Table I).

No patient showed bucking in the emergence phase.

Frequency of anaesthesia complications caused by LMA, in various age groups, is shown in Table II. Of the 2000 patients who underwent general anaesthesia with LMA for major ear surgery (mastoidectomy, tympanoplasty, radical mastoidectomy and cochlear implant), 246 (12.3%) patients developed haemodynamic instability with a significant relationship between age and instability ($p = 0.03$), 14.9% of whom in the age range 16-40 years and 20% aged > 60 years (Table II). The occurrence of this complication was not related to duration of surgery ($p = 0.2$). Moreover, no significant relationship was observed

Table I. Frequency of LMA complications in patients aged 3-70 years who underwent major ear surgery in Amir Alam Hospital from 1999 to 2006.

Complication	No.	Percent
Cough	10	0.5%
Haemodynamic instability	246	12.3%
Sore throat	2	0.1%
Nausea	139	7%
Vomiting	46	2.3%
Arytenoid dislocation	1	0.05%
Dysphonia	2	0.1%
Laryngospasm	1	0.05%
Failure of LMA insertion	3	0.15%
Vomiting in ward	16	15.6%
Nausea in ward	312	0.8%
Vocal cord paralysis	0	0%
Dimenhydrinate administration before surgery	1657	82.9%
Gastric regurgitation without aspiration immediately before LMA extraction	5	0.25%
Aspiration	0	0%
LMA dislocation during anaesthesia	20	1%

between sex and haemodynamic instability ($p = 0.4$). There was a significant relationship between the frequency of nausea and vomiting in the ward and the duration of surgery; the frequency of nausea and vomiting for those patients who had been under anaesthesia for <4 hours were 13.3% and 0.5%, respectively ($p < 0.05$). A higher frequency of nausea was observed among females (21.3%), but as far as concerns vomiting no difference was observed between sexes.

Cough developed in only 10 patients after surgery, most frequently in the those aged 3-7 and 8-15 years (0.9%) afflicting females more than males (0.7%) and primarily in those in whom surgery lasted > 4 hours (1.3%).

Although sore throat is a common complication of anaesthesia with tracheal tube [3], this was observed in only two patients who had used LMA (0.01%), both of whom females aged between 16 and 40 years.

Arytenoid dislocation was observed in only one male

Table II. Frequency of anaesthesia complications caused by LMA in various age groups in 3- to 70-year-old patients who underwent major ear surgery in Amir Alam Hospital from 1999 to 2006.

Complication		3-7 years No. (%)	8-15 years No. (%)	16-40 years No. (%)	41-60 years No. (%)	> 60 years No. (%)	Total No. (%)	p value
Nausea in ward	+	15 (6.5)	27 (9.4)	155 (15.4)	101 (26.9)	14 (14)	312 (15.6)	0.00
	-	217 (93.5)	259 (90.6)	851 (84.6)	275 (73.1)	86 (86)	1688 (84.4)	
Haemodynamic instability	+	30 (12.9)	32 (11.2)	108 (10.7)	58 (14.9)	20 (20)	246 (12.3)	0.03
	-	202 (87.1)	254 (88.8)	898 (89.3)	320 (85.1)	80 (80)	80 (87.3)	
Nausea	+	8 (3.4)	10 (3.5)	107 (10.6)	14 (3.7)	0 (0)	139 (7)	0.00
	-	224 (96.6)	276 (96.5)	899 (89.4)	362 (96.3)	100 (100)	1861 (93)	
Vomiting	+	0 (0)	2 (0.7)	32 (3.2)	12 (3.2)	0 (0)	46 (2.3)	0.003
	-	232 (100)	284 (99.3)	974 (96.8)	362 (96.8)	100 (100)	1954 (97.3)	
LMA dislocation during anaesthesia	+	4 (1.7)	3 (1)	9 (0.9)	3 (0.8)	1 (1)	20 (1)	0.8
	-	228 (98.3)	283 (99)	997 (99.1)	373 (99.2)	99 (99)	1980 (99)	
Vomiting in ward	+	4 (1.7)	0 (0)	10 (1)	0 (0)	2 (2)	16 (0.8)	0.03
	-	228 (98.3)	286 (100)	996 (99)	376 (100)	98 (98)	1984 (99.2)	
Cough	+	2 (0.9)	2 (0.9)	6 (0.6)	0 (0)	0 (0)	10 (0.5)	0.4
	-	230 (99.1)	284 (99.1)	1000 (99.4)	376 (100)	100 (100)	1990 (99.5)	
Regurgitation	+	0 (0)	1 (0.3)	2 (0.2)	1 (0.3)	1 (1)	5 (0.3)	0.5
	-	232 (100)	285 (99.7)	1004 (99.8)	375 (99.7)	99 (99)	1995 (99.7)	
Failure of LMA insertion	+	0 (0)	0 (0)	3 (0.3)	0 (0)	0 (0)	3 (0.2)	0.5
	-	232(100)	286 (100)	1003 (99.7)	376 (100)	100 (100)	1997 (99.8)	

(0.5%) in whom duration of surgery was <4 hours and this was reduced, the day after surgery, with the laryngologist's manipulation.

Dysphonia and transient hoarseness after surgery occurred in 2 patients (0.1%) both of whom were in the 16-40 years age group and, in both, surgery duration was <4 hours. Thus, no relationship was observed between this complication and patient age or duration of surgery.

Overall, 139 patients (7%) had nausea after surgery (in recovery), 9.4% of whom were females (p value < 0.05), 3.7% of them in the 16-40 years age group and 9.6% had surgery duration > 4 hours; thus, a significant relationship is observed between patient sex and occurrence of nausea after surgery.

Laryngospasm occurred in only one patient after LMA extraction (0.5%). The patient was 12 years old and due to the low frequency, no relationship was observed between occurrence of laryngospasm and patient age or duration of surgery.

Vomiting during recovery was observed in 2.3% of patients, 3.2% of whom were in the 16-40 and 41-60 years age groups. A significant relationship was observed between this complication and sex (p value < 0.05); 3.8% of patients with this complication were female and it was more frequently observed in those cases in which duration of surgery exceeded 4 hours (5.1%).

Discussion

Use of the laryngoscope and tracheal tube, during general anaesthesia, is associated with many complications such as sore throat, cough, nausea, laryngospasm, arytenoid dislocation, vocal cord paralysis, compulsory injection of muscle relaxants for tube insertion as well as possible risks related to removal at the end of anaesthesia. LMA offers a reliable airway control during general anaesthesia, without serious complications or need for muscle relaxants for insertion, and may thus be considered a suitable alternative to the tracheal tube. In major ear surgery, in which injection of muscle relaxants, to retain the functionality of the seventh cranial nerve, is not feasible, it would appear logical to use LMA and the technique of spontaneous breathing for general anaesthesia under capnograph monitoring.

Duff [1], in a 1999 issue of *The Laryngoscope,* reported the use of LMA in 100 cases of general anaesthesia for major ear surgery. No cases of gastric regurgitation were reported with the exception of one case of regurgitation which occurred without aspiration, immediately prior to LMA extraction. Overall, 3 patients complained of sore throat following surgery, in recovery, but in all 3 the situation improved after 24 hours. Hoarseness, dysphagia, laryngospasm and nausea were not observed. In one case, surgery was interrupted due to patient's movement during the operation. In conclusion, Duff reported LMA to be a safe airway device during general anaesthesia in patients undergoing major ear surgery, requiring no muscle relaxant for insertion and involving considerably fewer complications.

In this study, we evaluated patients, aged 3 to 70 years who had undergone major ear surgery in Amir Alam Hospital. The laryngeal mask replaced tracheal tubes during anaesthesia in all these patients. Of the 2000 patients included in the study, 246 (12.3%) developed haemodynamic instability which showed a significant relationship with age (p value = 0.03). The occurrence of this complication was not related to the duration of surgery (p value = 0.2). Moreover, no significant relationship was observed between sex and haemodynamic instability (p value = 0.4). A significant relationship was observed between the prevalence of nausea and vomiting in the ward and duration of surgery: the frequency of nausea and vomiting for those patients who had been under anaesthesia for < 4 hours were 13.3% and 0.5%, respectively (p value < 0.05). A higher frequency of nausea was observed among females (21.3%), but, as far as concerns vomiting, no difference was observed between sexes.

Cough developed in only 10 patients after surgery, most frequently in the age groups 3-7 and 8-15 years (0.9%) affecting females more than males (0.7%) and mostly with surgery that lasted longer than 4 hours (1.3%). Although sore throat is a common complication of anaesthesia with tracheal tube [3], it was observed in only 2 patients who had used LMA (0.01%). A total of 139 patients (7%) had nausea after surgery (in recovery), 9.4% of whom female (p value < 0.05); 3.7% of these patients were in the 16-40 years age group and in 9.6% duration of surgery exceeded 4 hours; thus, a significant relationship is observed between sex and nausea after surgery.

LMA was approved by the FDA in 1991, and its use in airway management has been gaining popularity ever since [4]. The advantages include easy insertion, lowering of the risk of vocal cord paralysis, and minimal cardiovascular response in comparison with other methods of airway management [5 6] with only 12.3% of patients in our study developing haemodynamic instability. Lighter depth of anesthesia are better tolerated in these patients and there is a lower risk of bronchospasm, laryngospasm, and sore throat [4 7-10]. Oesophageal and endo-bronchial intubation do not occur with this method.

Formerly, use of LMA was limited to those patients with difficult airways [11 12] but now it is popular for all cases of general anaesthesia unless contra-indicated. Use of LMA in ear surgery is well justified due to the fact that it causes no superior airway stimulation (bucking) in the emergence phase. Furthermore, it does not require muscle relaxants for insertion, thus making monitoring of the facial nerve easier during surgery [13]. In the study conducted by Ates et al. [2] none of the patients developed bucking and, in our study, only one case of bucking, followed by laryngospasm, was observed. LMA insertion required anaesthesia levels similar to those required for insertion of the oro-laryngeal airway [10].

At this level of anaesthesia, LMA can be used as a safe airway during spontaneous respiration without compromising airway security in ear surgery [14]; in our study, no cases indicating intubation were found. Considering the findings emerging from our study, only two complications of nausea and vomiting were more frequently observed; since these complications represent a minimum threat to patients, it is safe to say that LMA involves minimal complications.
The frequency of severe complications such as laryngospasm, dysphonia and arytenoid dislocation was 1, 2, and 2, in 2000 patients, respectively; this fact is further proof that the complications of LMA are minimal.

Conclusions

Taking into consideration the findings obtained in our study and the large number of patients evaluated, we may assure anaesthesiologists that LMA use, in major ear surgery, involves minimal complications and is, indeed, a safe device.

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