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Airway management in patients with cleft lip and palate: Evaluation of intubation conditions with videolaryngoscopy

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Abstract

Cleft lip and palate are one of the most common congenital head and neck anomalies and are seen at a frequency of 11-15%. In this study we aimed to observe airway management and intubation conditions with videolaryngoscopy in patients with cleft lip and palate. 40 patients with cleft lip and palate (Group Y) and 40 normal patients (Group N) aged between 4 months and 10 years undergoing elective surgery were included in this prospective randomized study. Mallampati Classification (MMC), Cormack-Lehane Classification (CL-S), thyromental distance (TMM) and mouth opening were evaluated to predict difficult airway. Intubation times, number of intubation attempts, heart rate (HR), mean arterial pressure (MAP), peripheral oxygen saturation (SpO2) and end-tidal CO2 (Et-C02) values were also recorded. Intubation times was significantly higher in Group Y than Group N. HR and MAP values measured in Group Y were found to be significantly higher than Group N at the 5th and 10th minutes ($p < 0.05$). Et-CO2 values in Group Y were found significantly higher than Group N at the 0 and 2 minutes of measurement times. It was observed that intubation was more difficult and the duration of intubation was longer in patients with cleft lip and palate compared to normal patients in the same age group. Because of this reasons hemodynamic and respiratory parameters were negatively affected in these patients.

Keywords: Cleft lip, cleft palate, video-laryngoscopy, difficult intubation

Introduction

Cleft lip-palate are the most common craniofacial anomalies in children, with an incidence of 1:800 live births. In patients with cleft lip and palate; macroglossia, microophthalmos, mental disorders, finger anomalies, hemifacial microsomies, Pierre Robin's, Treacher Collins and Goldenhar syndromes may also accompany this condition. Congenital heart disease (CHD) occurs in 5-10% of these patients. Complications such as difficult airway, unplanned extubation, compression or disconnection of the endotracheal tube, postoperative airway obstruction, hypoxia and pulmonary aspiration can be seen in these patients during general anesthesia [1.2].

Anatomical structures such as a disproportionately larger tongue, anterior and cephalic Iarynx orientation, a long epiglottis, short neck and trachea make intubation conditions more difficult in children [3]. In addition, low pulmonary reserve and high oxygen consumption increase the risk of hypoxia and limit intubation time in children [4].

Successful intubation requires adequate visualization of the airway and related structures. In recent years, it has been emphasized that videolaryngoscopy is superior to direct laryngoscopy in patients with difficult airway since it allows endotracheal intubation without aligning the axes of the oral cavity, pharynx and larynx in pediatric anesthesia [5.6].

Therefore, in our study, we aimed to observe the intubation conditions in children with cleft lip and palate in the presence of videolaryngoscopy (C-MAC videolaryngoscope).

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Material and Methods

This prospective, randomized and controlled study was conducted with the approval of Gaziantep University Faculty of Medicine Ethics Committee (decision no: 2016/329) and informed patient consent from the patients. Eighty patients between 4 months-10 years old, ASA I-II, undergoing elective surgery were included in the study.

Patients with cardiovascular system, respiratory system, central nervous system diseases, syndromic patients, patients with a history of allergy to drugs to be administered, patients who are considered difficult intubation due to reasons such as mass in the mouth, cervical trauma, patients with isolated cleft palate, isolated cleft lips and the patients without their parents' consent were excluded from the study.

The patients included in the study were evaluated preoperatively before the operation. They were randomly divided into 2 groups:

Group Y: Children with cleft lip and palate

Group N: Normal children

Age, gender and body mass index were recorded as demographic features in the preoperative evaluation. Mallampati Classification (MMC), Cormack-Lehane Classification (CL-S), thyromental distance (TMM) and mouth opening were recorded to predict difficult airway.

Standard monitoring was applied to the patients after the airway evaluation was completed. Anesthesia induction was performed with 2 mg / kg propofol in patients with vascular access, and 100% O2 and 8% sevoflurane with a mask suitable for the patient's surface in patients who do not have vascular access or do not allow for it, and then the vascular access was established with a suitable intravenous cannula. Then 0.5 µg / kg iv fentanyl was administered to each patient. After it was seen that they could be ventilated, 0.5 mg / kg iv rocuronium was administered for muscle relaxation. Video laryngoscopy was started 2-3 minutes after rocuronium administration. The screen of the C-MAC video laryngoscope was prepared before the procedure and blade mounted on it, the image was obtained by placing it in the mouth from the midline of the tongue. Endotracheal intubation was performed by viewing the screen for both groups. The duration between the laryngoscope blade entering into the patient's mouth and the end tidal CO2 value was seen was accepted as the time of intubation and recorded. Modified Cormack Lehane scoring system was used to evaluate vocal cords and intubation difficulty with C-MAC video laryngoscope. Heart rate (HR), mean arterial pressure (MAP), peripheral oxygen saturation (SpO2) and end tidal CO2 (et-CO2) values were recorded at certain time intervals The patient's measurements before induction and at 0, 2, 5 and 10 minutes after intubation were recorded. The number of intubation attempts was recorded. Laryngeal Mask Airway (LMA) application was planned as an alternative method in cases that failed after the third attempt.

Statistical Method

Based on previous studies, when the type I error was 0.05 and the power is 0.90, the minimum sample size was determined as 40 patients per group. Compliance of numerical data to normal distribution was tested with Shaphiro wilk test. Student-t test was used to compare two independent groups of variables with normal distribution. The relationship between categorical variables was tested by chi-square analysis. SPSS 22.0 package program was used in the analyzes. P <0.05 was considered significant.

Results

Demographic data of the patients were similar in the two groups (p> 0.05) (Table 1). There was no significant difference between the two groups in terms of Mallampati scores, thyromental distance, mouth opening measurements and difficult mask ventilation values. (p> 0.05) (Table 2). The number of patients with Cormake-Lehane score-1 was 13 in group Y and 28 in group N, and there was a statistically significant difference between the groups (p <0.05) (Table 3). When the number of intubation and reintubation attempts were compared, no significant difference was found between the two groups (p> 0.05) (Table 3). Intubation times were found to be statistically significantly higher in Group Y (50.49 ± 28.86) compared to Group N (29.21 ± 13.73) (p <0.05) (Table 3). There was no significant difference in saturation values after intubation between the groups (p> 0.05). When the MAP and HR values were compared, the 5th and 10th minutes MAP and HR values were measured significantly higher in Group Y than Group N (p <0.05) (Figure 1) (Figure 2). Et-CO2 values at 0 and 2 minutes were significantly higher in Group Y than Group N (p <0.05) (Figure 3).

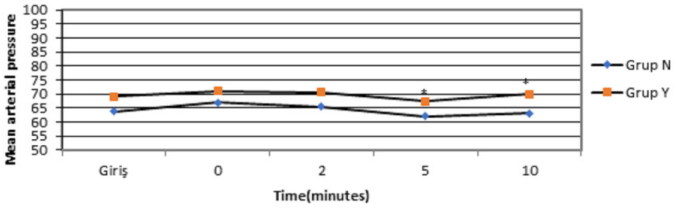

Figure 1. Mean arterial pressure changes of the groups. *: P<0.05

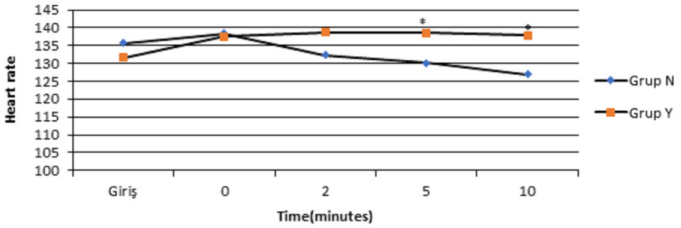

Figure 2. Heart rate changes of the groups. *: P<0.05Discussion

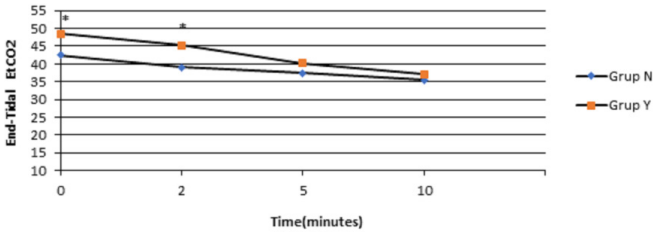

Figure 3. End-tidal CO2 changes of the groups. *: P<0.05

Table 1. Demographic data of the groups (mean ± SD)

	GRUP N	GRUP Y	P
Female [n (%)]	18 (45 %)	18 (45 %)	1.000
Male [n (%)]	22 (55 %)	22 (55 %)	1.000
Years	14.45 ± 12.36	13.32 ± 6.48	0.612
BMI	17.88 ± 3.96	16.76 ± 3.93	0.209

Table 2. Comparison of mouth opening, thyromental distance, mallampati scoring and difficult mask ventilation by groups [n (%)]

		Grup N	Grup Y	Total	P
Oral measure (cm)		2.78	5.59		0.156
Thyromental distance(cm)		3.40	3.20		0.128
Mallampati score	I	30(75%)	20 (50 %)	50 (62.5%)	0.087
	II	6 (15 %)	8 (20 %)	14 (17.5%)	
	III	2 (5 %)	7 (17.5%)	9 (11.2%)	
	IV	2 (5 %)	5(12.5%)	7 (8.8%)	
Difficult-Mask Ventilation		0	2(5.0%)	2 (2.5%)	0.093

Table 3. Cormack-Lehane classification, number of intubation attempts, reintubation rates and intubation times in the groups

		Grup N	Grup Y	P
CL-S I /II /III /IV		13 /16 /4 /7	28* /8 /2 /2	0.658
Intubation	**1 Attempt**	37 (92.5%)	34 (85.0%)	0.365
	2 Attempt	3 (7.5%)	5 (12.5%)	
	3 and more	0	1 (2.5%)	
Reintubation		0	1(2.5%)	
Intubation time (sec)		29.21 ± 13.7	50.49 ± 28.8*	0.001

Values are presented as number (%) or mean ± standard deviation. CL-S: Cormake-Lehane Score. *: P<0.05

Discussion

Cleft lip and palate is one of the most common congenital malformations of the head and neck region. Cleft lip and palate are often associated with retrognathia, micrognathia and glossopatosis. In our study, we aimed to evaluate the intubation conditions under general anesthesia with videolaryngoscopy in pediatric patients who had no facial or mouth anomalies other than cleft lip and palate.

Windsor et al. indicated that after evaluating all difficult intubation criteria and providing all the tools related to difficult intubation, intubation attempts to be performed by an experienced anesthesiologist can be successful [7.8]. In our study, in accordance with the literature, intubation was performed by an experienced anesthesiologist who completed 3 years.

Cavus et al. used C-MAC VL in patients intubated for various reasons in the emergency department. 63 of 80 patients were intubated at the first attempt, 13 at the second, and 4 at the third attempt. As a result, it has been stated that the C-MAC videolaryngoscope is suitable fore mergency endotracheal intubations in complicated airway conditions such as maxillofacial trauma [9].

J. McElwain et al. compared C-MAC with Macintosh, Glidescope and Airtraq laryngoscopes in easy and difficult intubations. In easy laryngoscopy, the duration of tracheal intubation attempts with C-MAC VL was similar to Macintosh and Airtraq laryngoscopes but better than the Glidescope. In difficult laryngoscopy, the C-MAC videlaryngoscope has been identified as the device with the shortest tracheal intubation time and the easiest to use [10].

Adenekan et al. evaluated perioperative airway problems in 116 patients who underwent palate repair in their study, and 6 patients (4.6%) were found to have airway problems. Airway problems experienced included postoperative pneumonia (2 patients), unsuccessful intubation (1 patient), difficult intubation (1 patient), post-extubation bronchospasm (1 patient) and laryngeal edema (1 patient) [11].

In our study where we used C-MAC VL, when the number of intubation attempts was compared, in Group Y, 34 patients (85.0%) were successfully intubated at the first attempt, 5 patients (12.5%) at the second attempt and 1 patient (2.5%) at the third attempt. In Group N, 37 patients (92.5%) were intubated at the first attempt and 3 patients (7.5%) at the second attempt, and there were no patients intubated at the third attempt in this group.

When the successful intubation time was compared in our study, it was found to be 50.49 seconds in Group Y and 29.21 seconds in Group N. There was a significant difference between successful intubation times in the two groups. Although C-MAC VL was used in both groups, we think that the reason for the longer intubation time in GROUP Y may be the difficulties arising from the anatomical structure.

Law et al. reported that the cause of anesthetic morbidity in cleft lip and palate operations was mostly related to airway complications such as difficult intubation, compression of the intubation tube, the intubation tube going further than necessary, or unplanned extubation [12].

It is thought that tracheal intubation enhances the hemodynamic response by stimulating the receptors in the larynx and trachea, and may increase morbidity and motality in high-risk patients [13].

Z. Kayhan et al. Reported that blood pressure, heart rate, plasma epinephrine, norepinephrine and vasopressin concentrations increased in response to laryngoscopy and tracheal intubation [14].

D. Y. Qi et al. reported that in pediatric anaesthesia, laryngoscopy and tracheal intubation temporarily increased catecholamine levels, HR and MAP [15].

In our study, HR and MAP were significantly higher in Group Y compared to Group N in the measurements at the 5th and 10th minutes. It was thought that this situation might be due to the prolongation of intubation time and difficulty in intubation in Group Y.

Again, the fact that the end-tidal CO2 values between the groups are significantly higher in Group Y compared to Group N up to the 5th minute correlates with the significantly longer intubation time in Group Y. This situation was thought to be the result of intubation difficulty.

Conclusion

In our study where we compared the intubation conditions, intubation success and haemodynamic parameters of patients who had no mouth and facial anomalies other than cleft lip and palate and intubated with C-MAC videosyngoscope; it was observed that the intubation of patients with cleft lip and palate was more difficult, the duration of intubation was longer and the hemodynamic and respiratory parameters were affected negatively compared to normal patients in the same age group. Therefore, intubation performed with using a video laryngoscope, and more attention should be paid in patient follow-up.

Conflict of interests
The authors declare that they have no competing interests.

Financial Disclosure
All authors declare no financial support.

Ethical approval
Gaziantep University Faculty of Medicine Ethics Committee (decision no: 2016/329)

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