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Anesthetic Approach and Perioperative Complications in Cleft Lip/Palate Surgery: A Single Center Retrospective Study

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ABSTRACT

Objective: The objective of this study was to determine factors that may affect anesthesia and surgical complications, difficult airway, and the need for intensive care unit (ICU) care in cleft lip and cleft palate (CLCP) surgeries.

Materials and Methods: The study was a retrospective review of the records of 617 patients who underwent CLCP surgery between 2015–2019.

Results: The number of anesthesia complications was higher in patients with difficult mask ventilation. Surgical complications were more common in patients >1 year of age. Isolated cleft palate (CP) surgery; presence of a concomitant disease, syndrome, or micrognathia; age >1 year; and the CP subtype were associated with a higher rate of difficult intubation. Isolated cleft palate, concomitant disease, syndrome, micrognathia, difficult intubation, difficult mask ventilation, and anesthesia complications were associated with ICU admission.

Conclusion: The CP subtype was associated with a higher rate of difficult intubation and ICU hospitalization even in patients who were nonsyndromic and/or >1 year of age. Therefore, special attention should be paid to the anesthesia and surgical management of these patients.

Keywords: Airway management, cleft lip and palate, difficult airway, pediatric anesthesia, video laryngoscopy

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INTRODUCTION

The rate of perioperative complications ranges from 3% to 23% in cleft lip/palate (CLCP) surgeries, typically due to the presence of a concomitant disease or syndrome, anatomical disorders, nutritional deficiencies, or postoperative airway changes (1–3). Airway and respiratory complications are among the most fatal. The primary reasons for airway and respiratory complications in CLCP surgeries are anatomical defects and the presence of a difficult airway. Anesthesiologists should always be ready for difficult mask ventilation and/or difficult intubation in these patient groups. It is essential to anticipate factors that may cause complications and difficult airway situations to improve patient safety. The aim of this study was to determine factors that may affect perioperative complications and difficult airway in CLCP surgeries.

MATERIALS and METHODS

Approval for the study was granted by the Hacettepe University Non-Interventional Clinical Research Ethics Board on October 15, 2019 (no: GO 19/1004). The demographic data, intraoperative anesthesiology records, and postoperative follow-up records of patients who underwent CLCP surgery at Hacettepe University Hospital between 2015–2019 were evaluated retrospectively.

The standard anesthesia protocol for CLCP surgeries used at the hospital was applied in all cases during the perioperative period. The patients were not premedicated before surgery. Standard monitoring, consisting of electrocardiography, pulse oximetry, and noninvasive blood pressure measurement, was also applied in all cases. All of the patients were preoxygenated and a shoulder roll was positioned before induction (Fig. 1a). Placing a roll support under the shoulder helps open the airway by raising the shoulders and providing slight head extension (4). After preoxygenation with 100% oxygen, anesthesia induction was performed with 6–8% sevoflurane in a 50–50% oxygen-air mixture. Once the patients were unconscious, an appropriately sized intravenous catheter was inserted and anesthesia induction was continued with 1 $mg.kg^{-1}$ propofol, 0.5 $mcg.kg^{-1}$ fentanyl, and 0.5 $mg.kg^{-1}$ rocuronium bromide. Methylprednisolone (1–2 $mg.kg^{-1}$) was administered after induction to reduce airway edema. The two-hand mask ventilation technique (L-E) was used for all patients (Fig. 1b). Following adequate muscle relaxation, endotracheal intubation was performed with a tube of suitable size and depth.

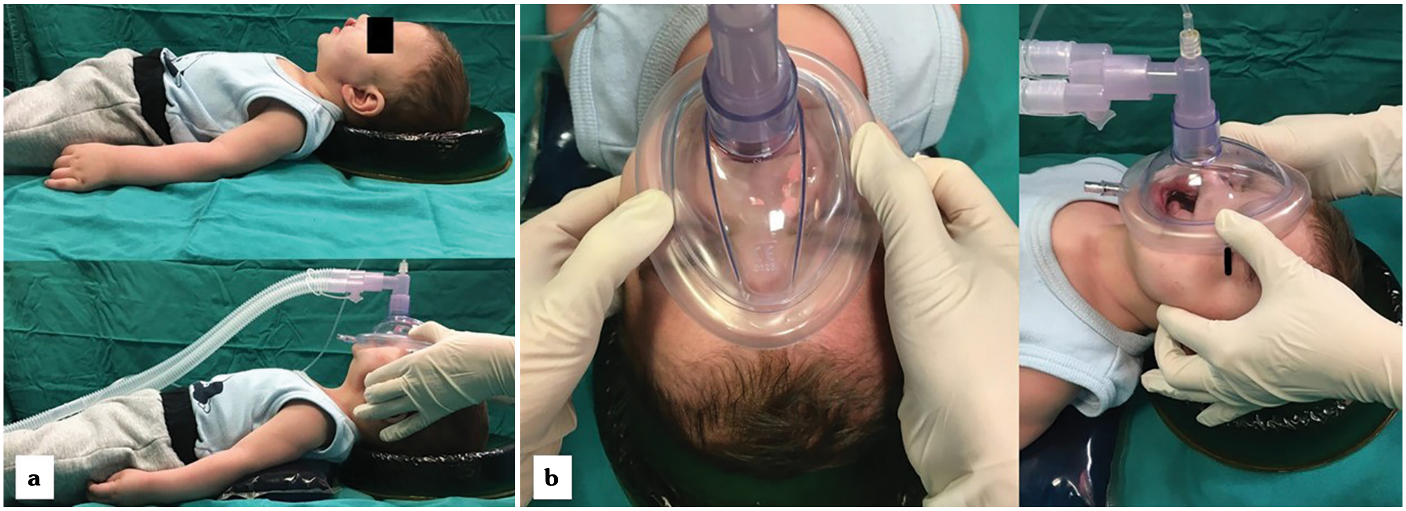

Figure 1. **(a) Patient position with a shoulder roll; (b) Two-handed mask ventilation technique (Photos used with the permission of the authors of "Damak ve Dudak Yarıkları Hacettepe Ekip Yaklaşımı")**

Since the data collected predated coronavirus 2019 (COVID-19) pandemic, no related measures were performed during the application of anesthesia. Direct laryngoscopy (DL) was the routine tracheal intubation technique, used in cases where difficult intubation was not anticipated. Difficult intubation was defined according to the Cormack-Lehane Classification (Class 1–2=easy intubation, 3–4=difficult intubation) (5). Video laryngoscopy (VL) and fiberoptic bronchoscopy (FOB) were the alternative techniques for difficult intubation. VL was usually the first choice in syndromic children. In cases with very pronounced retrognathy or if VL failure was predicted, intubation via nasal FOB performed by an experienced anesthesiologist was the first choice in order to minimize the number of attempts.

Anesthesia was maintained with 2% sevoflurane and 50% air in oxygen. The sevoflurane concentration was titrated based on the minimum alveolar concentration level of 1.3. Intraoperative analgesia was provided with local anesthetic infiltration to the surgical area by the surgeon and intravenous administration of 15 $mg.kg^{-1}$ paracetamol. Muscle relaxation was reversed with 2–4 $mg.kg^{-1}$ sugammadex at the conclusion of the operation. The patients were extubated when spontaneous respiratory functions returned and were transferred to a postanesthesia recovery room and subsequently to the ward. Patients who were not extubated immediately after surgery or who needed intensive care follow-up were transferred to the postoperative intensive care unit (ICU). The criteria used to postpone extubation were anatomical (i.e., postoperative narrowing of airway passage, syndromic patients with difficult airway passage), physiological (i.e., hemodynamic instability), and contextual factors (optimized time of day, location, or personnel).

Statistical Analysis

All of the analyses were performed using SPSS for Windows, Version 11.5 statistical software (SPSS Inc., Chicago, IL, USA). The normality of the distribution of continuous variables was determined using the Kolmogorov-Smirnov test. Age and weight were expressed as median (min–max) due to non-normal distribution. Categorical data were shown as the number of cases and percentages. To compare the data in 2 groups, chi-squared and Mann-Whitney U tests were used as applicable. A p value of <0.05 was considered statistically significant. Parameters that might affect difficult intubation and ICU admission were evaluated using binary logistic regression analysis. The goodness-of-fit of the models was evaluated with the Hosmer-Lemeshow test. All regression coefficients given in logistic regression were nonstandardized B values and were given with the standard error (SE).

RESULTS

A total of 617 patients were included in the study. The median age was 8 months (min–max: 1–120 months), and the median body weight was 8.00 kg (min–max: 4–30 kg). The majority of the patients were <1 year old (n=523, 84.8%). The gender distribution was 236 (38.2%) females and 381 (61.8%) males. Combined cleft lip and palate (CLP) was the most frequent cleft subtype (n=379, 61.4%), followed by isolated cleft palate (CP) (n=124, 20.1%) and isolated cleft lip (CL) (n=114, 18.5%). While the CP subtype was seen in 17% (n=89) of patients <1 year of age, the rate reached 36% (n=34) in patients aged >1 year. More than half of the patients (n=331, 53.6%) underwent CP surgery, while the remainder (n=286, 46.4%) had CL surgery. CP surgery was performed in 48% (n=253) of the patients <1 year old and 83% (n=78) of those >1 year old. Nearly half of the patients (n=260, 42%) had at least 1 concomitant disease. Cardiovascular system diseases were the most common comorbidity (n=205, 33.2%). Among them, patent foramen ovale was the most frequent (n=103, 16.7%). Twenty patients (3.2%) had a diagnosed syndrome. The most common syndrome was Pierre Robin sequence (n=9). Other syndromes recorded included Goldenhar syndrome (n=2), Alx 1 mutation (n=2), DiGeorge syndrome, Down syndrome, 2q deletion, trisomy 13, Alport syndrome, Kabuki syndrome, and Apert syndrome. Fifteen patients (2.4%) had micrognathia.

DL (n=569, 92.2%) was the most commonly used intubation method, followed by VL (n=39, 6.3%) and FOB (n=9, 1.5%). Intubation was difficult in 35 patients (5.7%). When we divided patients into 2 groups according to intubation difficulty (difficult intubation: Cormack-Lehane 3 or 4, easy intubation: Cormack-Lehane 1 or 2); we found that the CP subtype, CP surgery, a concomitant disease

Table 1. Factors associated with difficult intubation

	Cormack-Lehane 1–2 (n=582)			Cormack-Lehane 3–4 (n=35)			p
	Count	% of 1–2 group	% of total	Count	% of 3–4 group	% of total	
A. Factors that can cause difficult intubation							
Age							0.001*
<1 year	501	86.1%	95.8%	22	62.9%	4.2%	
≥1 year	81	13.9%	86.2%	13	37.1%	13.8%	
Type of cleft							<0.001*
CL	112	19.2%	98.2%	2	5.7%	1.8%	
CP	105	18.0%	84.7%	19	54.3%	15.3%	
CLP	365	62.7%	96.3%	14	40.0%	3.7%	
Type of surgery							0.036**
CL	276	47.4%	96.5%	10	28.6%	3.5%	
CP	306	52.6%	92.4%	25	71.4%	7.6%	
Concomitant disease							<0.001*
No	347	59.6%	97.2%	10	28.6%	2.8%	
Yes	235	40.4%	90.4%	25	71.4%	9.6%	
Syndrome							<0.001*
No	569	97.8%	95.3%	28	80.0%	4.7%	
Yes	13	2.2%	65.0%	7	20.0%	35.0%	
Micrognathia							<0.001*
Yes	7	1.2%	46.7%	8	22.9%	53.3%	
No	575	98.8%	95.5%	27	77.1%	4.5%	
B. Outcomes of difficult intubation							
Intubation technique							<0.001*
FOB	2	0.3%	22.2%	7	20.0%	77.8%	
DL	562	96.6%	98.8%	7	20.0%	1.2%	
VL	18	3.1%	46.2%	21	60.0%	53.8%	
Anesthesia complication							0.106
Yes	8	1.4%	80.0%	2	5.7%	20.0%	
No	574	98.6%	94.6%	33	94.3%	5.4%	
Surgery complication							0.110
Yes	18	3.1%	85.7%	3	8.6%	14.3%	
No	564	96.9%	94.6%	32	91.4%	5.4%	
Postoperative extubation							0.004*
Yes	541	93.0%	95.2%	27	77.1%	4.8%	
No	41	7.0%	83.7%	8	22.9%	16.3%	
ICU stay							<0.001*
Yes	57	9.8%	75.0%	19	54.3%	25.0%	
No	525	90.2%	97.0%	16	45.7%	3.0%	

*: p<0.05; **: p<0.010; CL: Cleft lip; CLP: Cleft lip and palate; CP: Isolated cleft palate; DL: Direct laryngoscopy; FOB: Fiberoptic bronchoscopy; ICU: Intensive care unit; VL: Video laryngoscopy

or syndrome, micrognathia, and age >1 year were factors related to increased incidence of difficult intubation. The median age of patients with difficult intubation was greater than that of patients with easy intubation (p=0.001). The most frequently used method for difficult intubation was VL (n=21). Fifty-four percent of patients with difficult intubation were transferred to the postoperative ICU regardless of intubation/extubation status. While the rate of transfer to the ICU while intubated was 7% (n=41) in patients without difficult intubation, 22.9% (n=8) of those with a difficult intubation were transferred to the ICU (Table 1).

Table 2. Difficult intubation – binary logistic regression

Variables	Univariate				Multivariate			
	Wald	OR	95% CI	p	Wald	OR	95% CI	p
CP vs CL	9.391	10.133	2.304–44.566	0.002	4.726	6.671	1.205–36.917	0.03*
CLP vs CL	1.002	2.148	0.481–9.594	0.317	–	–	–	–
Micrognathia (+) vs (-)	33.230	24.339	8.221–72.052	<0.001	–	–	–	–
CP vs CL (surgery type)	4.501	2.255	1.064–4.779	0.034	–	–	–	–
CCD (+) vs (-)	11.593	3.691	1.741– 7.829	0.001	6.424	2.873	2.873–1.270	0.011*
Syndrome (+) vs (-)	22.253	10.942	4.049–29.569	<0.001	–	–	–	–
Age <1 year vs >1 year	12.286	3.655	1.771–7.544	<0.001	3.945	2.433	1.012–5.853	0.047*

*: p<0.05; **: p<0.010; CCD: Concomitant disease; CL: Cleft lip; CLP: Cleft lip and palate; CP: Isolated cleft palate; OR: Odd ratios; CI: Confidence interval

Significant variables that can cause difficult intubation (Table 1a) were included in binary logistic regression analysis to identify independent risk factors. The results partially supported the results above (Table 2). The Hosmer-Lemeshow test revealed that the model had a goodness-of-fit to the data of p=0.995 (>0.05). Regression analysis indicated that the presence of the CP subtype increased the probability of difficult intubation by 6.6 times compared with the CL subtype (Exp B=6.671, 95% CI=1.205–36.917, B=1.898, SE=0.873, p=0.03). In the presence of concomitant disease, the probability of difficult intubation was 2.8 times greater than in the absence of concomitant disease (Exp B= 2.873, 95% CI= 2.873–1.270, B=1.055, SE=0.416, p=0.011). When the relationship between age and difficult intubation was examined, it was found that difficult intubation was 2.4 times greater in patients age >1 year than those <1 year of age (Exp B=2.433, 95% CI= 1.012–5.853, B=-0.889, SE=0.448, p=0.047). Undergoing CP surgery, and the presence of a syndrome or micrognathia were not found to be independent risk factors for difficult intubation in the regression analysis.

Desaturation, wheezing, reintubation, the need for a tracheotomy/tracheostomy, and dyspnea were the anesthesia-related complications reported (n=10, 1.6%). All of the anesthesia-related complications occurred in patients <1 year old, but this finding was not statistically significant (p=0.240). Difficult mask ventilation was seen in only 3 patients. One of these patients had undergone CL surgery and 2 had CP surgery. All were managed using the 2-handed mask ventilation technique with oropharyngeal airway and/or supraglottic airway. However, one required emergency front of neck access during ICU follow-up due to a postoperative "cannot intubate, cannot oxygenate" situation. The procedure was performed and there were no further complications.

There was a statistically significant incidence of transferring patients with anesthetic complications to postoperative ICU (p<0.001). Bleeding, infection, fistula formation, fever, and evisceration of the mucosa were the surgery-related complications noted (n=21, 2.1%). The percentage of surgical complications was higher in syndromic and micrognathic patients and in patients ≥1 year of age (p=0.027, p=0.012, p<0.001, respectively).

Forty-nine patients (7.9%) had mechanical ventilation support during transport to ICU. A tracheostomy was performed in 2 of these 49 patients during surgery. Twenty-seven patients were extubated before transfer to the ICU. One of these patients developed postoperative respiratory distress, which led to an emergency tracheostomy in the ICU. In all, 76 patients (27 extubated, 47 intubated, 2 with tracheostomy) were transferred to the ICU in the postoperative period. Patients with the CP subtype, concomitant disease, syndrome, micrognathia, difficult intubation and/or mask ventilation, or anesthesia-related complications were more likely to be followed up in the ICU than those without (Table 3). The results of binary logistic regression analysis (Table 4) indicated that the presence of anesthesia complication increased the probability of a postoperative ICU stay by 67 times (Exp B=67.127, 95% CI=7.944–567.228, B=4.207, SE=1.089, p<0.001). The presence of a difficult intubation increased the probability of an ICU stay by 7.8 times (Exp B=7.842, 95% CI=2.350–26.172, B=2.059, SE=0.615, p<0.001). In the presence of concomitant disease, the probability of difficult intubation was increased by 7.9 times compared with the absence of a comorbidity (Exp B=2.257, 95% CI=1.283–3.967, B=0.814, SE=0.288, p=0.005). The Hosmer-Lemeshow test suggested that the model had a good fit with a finding of p=0.532 (>0.05). The CP subtype, syndrome, micrognathia, and difficult mask ventilation variables were not independent risk factors for an ICU stay.

DISCUSSION

In this study of 617 patients, we investigated factors related to a difficult airway, perioperative complications, and postoperative ICU care. Age >1 year, CP subtype, CP surgery, the presence of a concomitant disease and/or syndrome, and micrognathia were the factors related to difficult intubation. The factors affecting the need for postoperative ICU care included the CP subtype, the presence of concomitant disease and/or syndrome, micrognathia, difficult intubation, difficult mask ventilation, and anesthesia-related complications.

The majority of the patients were <1 year old. CLP was the most common cleft type in all age groups. The most common concomitant disease was congenital heart disease, and the most common syndrome was Pierre Robin sequence. CP surgeries were performed more frequently after 1 year of age. The demographic data of the patient group were similar to those reported in the literature (6–9).

Table 3. Factors associated with postoperative intensive care unit stay

	ICU stay (-) n=541			ICU stay (+) n=76			p
	Count	% of stay (-)	% of total	Count	% within stay (+)	% of total	
Age							0.051
<1 year	464	85.8%	88.7%	59	77.6%	11.3%	
≥1 year	77	14.2%	81.9%	17	22.4%	18.1%	
Type of cleft							0.004**
CL	107	19.8%	93.9%	7	9.2%	6.1%	
CP	99	18.3%	79.8%	25	32.9%	20.2%	
CLP	335	61.9%	88.4%	44	57.9%	11.6%	
Type of surgery							0.141
CL	257	47.5%	89.9%	29	38.2%	10.1%	
CP	284	52.5%	85.8%	47	61.8%	14.2%	
Concomitant disease							<0.001**
No	330	61.0%	92.4%	27	35.5%	7.6%	
Yes	211	39.0%	81.2%	49	64.5%	18.8%	
Syndrome							0.027*
No	527	97.4%	88.3%	70	92.1%	11.7%	
Yes	14	2.6%	70.0%	6	7.9%	30.0%	
Micrognathia							0.006**
Yes	9	1.7%	60.0%	6	7.9%	40.0%	
No	532	98.8%	88.4%	70	92.1%	11.6%	
Intubation technique							<0.001**
FOB	4	0.7%	44.4%	5	6.6%	55.6%	
DL	510	94.3%	89.6%	59	77.6%	10.4%	
VL	27	5.0%	69.2%	12	15.8%	30.8%	
Difficult mask ventilation							0.041*
(+)	1	0.2%	33.3%	2	2.6%	66.7%	
(-)	540	99.8%	87.9%	74	97.4%	12.1%	
Anesthesia complication							<0.001**
Yes	1	0.2%	10.0%	9	11.8%	90.0%	
No	540	99.8%	89.0%	67	88.2%	11.0%	
Surgery complication							0.252
Yes	17	3.1%	81.0%	4	5.3%	19.0%	
No	524	96.9%	87.9%	72	94.7%	12.1%	
Postop extubation							<0.001**
Yes	541	100%	95.2%	27	35.5%	4.8%	
No	0	0	0	49	64.5%	100.0%	
Difficult intubation							<0.001**
Yes	16	3.0%	45.7%	19	25.0%	54.3%	
No	525	97.0%	90.2%	57	75.0%	9.8%	

*: p<0.05; **: p<0.010; CL: Cleft lip; CLP: Cleft lip and palate; CP: Isolated cleft palate; DL: Direct laryngoscopy; FOB: Fiberoptic bronchoscopy; ICU: Intensive care unit; VL: Video laryngoscopy

Studies have reported a rate of difficult intubation rates in CLCP surgeries of 2–8% and micrognathia has been emphasized as one of the most important parameters affecting intubation (10, 11). Micrognathia can cause difficulty both in mask ventilation and intubation due to increased posterior regression of the tongue and a narrowed hyomental distance (11). It was reported in an-

Table 4. Postoperative intensive care unit stay – binary logistic regression

Variables	Univariate				Multivariate			
	Wald	OR	95% CI	p	Wald	OR	95% CI	p
CP vs CL	9.018	3.860	1.599–9.321	0.003**	–	–	–	–
CLP vs CL	2.730	2.008	0.878–4.589	0.098	–	–	–	–
DL vs VL	1.875	2.813	0.640–12.358	0.171	–	–	–	–
FOB vs VL	13.007	0.260	0.125–.541	<0.001**	–	–	–	–
Micrognathia (+) vs (-)	8.958	5.067	1.751–14.663	0.003**				
CP vs CL (surgery type)	2.322	1.467	0.896–2.400	0.128	–	–	–	–
Difficult mask ventilation (-) vs (+)	4.742	0.069	0.006–0.765	0.029*	–	–	–	–
Extubation (+) vs (-)	0.000	0.000	0.000	0.997	–	–	–	–
CCD (+) vs (-)	16.688	2.838	1.721–4.682	<0.001**	7.981	2.256	1.283–3.967	0.005**
Syndrome (+) vs (-)	5.396	3.227	1.201–8.669	0.020*	–	–	–	–
Difficult intubation (+) vs (-)	42.522	10.937	5.329–22.448	<0.001**	11.216	7.842	2.350– 26.172	0.001**
Surgery complication (+) vs (-)	0.891	1.712	0.561–5.231	0.345	–	–	–	–
Anesthesia complication (+) vs (-)	16.272	72.537	581.507	<0.001**	14.925	67.127	7.944–567.228	<0.001**
Age <1 year vs >1 year	3.349	1.736	0.962–3.135	0.067	–	–	–	–

*: p<0.05; **: p<0.010; CCD: Concomitant disease; CL: Cleft lip; CLP: Cleft lip and palate; CP: Isolated cleft palate; DL: Direct laryngoscopy; FOB: Fiberoptic bronchoscopy; ICU: Intensive care unit; VL: Video laryngoscopy; OR: Odd ratios; CI: Confidence interval

other study that the difficult intubation rate of those with the CP subtype was as much as 10%, depending on the presence of an accompanying syndrome (12). In our study, difficult intubation was seen in 35 patients (5.7%). We found that the CP subtype, undergoing CP surgery, the presence of a concomitant disease or syndrome, and micrognathia were associated with difficult intubation. We observed difficult intubation was more frequently in patients aged >1 year, in contrast to other studies that found an increased risk at patients younger than 1 year of age (13). We attribute this difference to the higher frequency of CP subtypes and CP surgeries in patients aged >1 year, rather than the age itself. Regression analysis indicated that age was a significant independent variable. The anatomy of the upper airway structures in CP can be more deformed than in CL cases. Patients with the CP subtype have a higher probability of difficult intubation even if they are older or do not have a concomitant disease or syndrome. In addition to the already abnormal airway, there is a dramatic postoperative decrease in the upper airway volume in CP patients, which makes them more vulnerable to postoperative airway complications.

VL was the most common intubation method used in CLCP patients with difficult intubation before the emergence of COVID-19 (n=21), and became our standard method of endotracheal intubation during pandemic (14). Seven of 35 difficult intubation patients were intubated via unguided nasal FOB. In 6 of those cases, FOB was the first choice and evaluation using the Cormack-Lehane classification was performed after intubation and the results were recorded in the event of possible future surgeries. Since our institution is a tertiary CLCP surgery center, we encounter a lot of difficult intubation cases. Therefore, the fact that 28 of 35 patients with difficult intubation were intubated with advanced intubation methods (VL and FOB) may be an indicator of the number of cases with a prediction of difficult intubation in the preoperative period. It was important that we use advanced intubation methods as the first choice in patients with an anticipated difficult airway in order to avoid unnecessary interventions.

In a retrospective study conducted by Mahboubi et al. (15), the complication rate in 10,450 CLCP surgeries performed between 1997 and 2011 was 3.8%. In another study, the airway complication rate in CP surgeries was as high as 23% (16). Laryngospasm, bronchospasm, desaturation, wheezing, aspiration, unintentional extubation, and postoperative airway obstruction are among the frequently reported complications (17). Concomitant diseases and the experience of the anesthetic team were also found to be related to the incidence of complications. In our study, a total of 30 patients (4.9%) developed complications related to anesthesia and/or surgery. Similar to literature findings, 60% of these complications were in CP surgeries. Anesthetic complications occurred in 10 patients (1.6%) and surgical complications occurred in 21 patients (3.4%). We think that the relatively low rate of anesthetic complications is related to our experience and having a standard CLCP approach in our clinic. It was noteworthy that all of the anesthesia-related complications were in patients aged <1 year, but this finding was not statistically significant. The number of surgical complications was significantly higher in patients aged >1 year, those with a concomitant syndrome, and those with micrognathia (p=0.000 p=0.027, p=0.012, respectively). The higher rate of surgical complications in patients aged >1 year may be due to greater frequency of CP surgeries performed in this age group. Only 1 CP patient experienced postoperative acute upper airway obstruction due to anatomical changes, which necessitated an emergency tracheotomy.

Seventy-six patients (12.3%) were followed up in the ICU in the postoperative period. In another study of CLCP surgeries performed at our center between 2005 and 2013, the most common need for postoperative ICU care was airway complications and the need for close monitoring (18). Reports in the literature indicate that the need for ICU care increases with younger age, comorbidities, and airway problems. In this study, we found that the need for postoperative ICU follow-up was associated with similar reasons. The presence of concomitant disease and/or syndrome, micrognathia, difficult intubation, difficult mask ventilation, cleft type, and anesthetic complications increased the need for postoperative ICU follow-up in our patients. The results of regression analysis indicated that the presence of concomitant disease (2.2 times), anesthesia complications (67 times), and difficult intubation (7.8 times) increased the probability of transfer to the ICU. It should be taken into account that the presence of difficult intubation and anesthetic complications increased ICU hospitalization rates indirectly by decreasing postoperative extubation rates.

This study has several limitations. First, the design was retrospective. The degree of micrognathia, facial plane-chin distance or obstructive sleep apnea are some examples of data that could not be recorded due to the retrospective nature of the research. Secondly, statistical analysis regarding difficult mask ventilation, which might affect the rate of anesthetic complications, could not be performed due to limited number of patients. Another limitation is that we could not evaluate the cleft type from retrospective anesthesia records. The type of cleft and the width of the dissection site can be affect the level of airway obstruction. Finally, the recent widespread use of VL, at least in part due to changes implemented as a result of the COVID-19 pandemic, may be reason for new studies to determine any difference in complication rates or difficult airway incidence in CLCP surgeries.

In conclusion, the CP subtype, concomitant disease, and age >1 year were variables associated with difficult intubation. Nearly 1 in 10 patients needed postoperative ICU follow-up. Concomitant disease, difficult intubation, and anesthetic complications were associated with ICU admission. Isolated CP, as an independent risk factor, was associated with difficult intubation and indirectly increased the need for ICU care. Therefore, anesthetic and surgical teams should be aware of potentially increased risks in patients with CP, even if they are nonsyndromic and/or >1 year of age.

Ethics Committee Approval: The Hacettepe University Non-interventional Clinical Researches Ethics Committee granted approval for this study (date: 15.10.2019, number: GO 19/1004).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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