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Original Research

A Single Center Anesthesia Experience in Children Posted for Cleft Lip and Palate Repair: A Retrospective Analysis from a Post-Anesthesia Care Unit

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ABSTRACT

Objective: Cleft lip and palate (CLP) is one of the most commonly seen craniofacial abnormalities in children. Anesthesia management for these surgeries is challenging due to the emergence of airway problems and perioperative complications. In this study, we aimed to evaluate airway difficulties and perioperative anesthetic complications in children suffering from CLP.

Methods: After obtaining approval from the institutional review board, this retrospective study was conducted on 29 children that underwent CLP repair from January 2014 to December 2016 at a single center. Demographic parameters, patients with CLP, patients having micrognathia, associated syndromes, associated congenital abnormalities, difficult mask ventilation, difficult intubation, duration of anesthesia, number of intubated patients to be transferred to the post-anesthesia care unit (PACU), airway-associated complications, and intraoperative and postoperative complications were recorded.

Results: Data from a total of 29 patients with cleft palate were included. Out of the 29 patients, 15 patients had a cleft lip, 17 patients had micrognathia, and 10 patients had both cleft lip and micrognathia. Three patients had difficult mask ventilation, while seven had difficult intubation. Intubation failure was seen in three patients in whom a fiber optic laryngoscope was successfully utilized. Airway-associated complications were seen in six patients. Only three patients had postoperative complications. There were no mortalities.

Conclusion: CLP deformities in children with associated abnormalities are predisposed to difficult airway-associated and postoperative complications. Specialized perioperative care is necessary.

Keywords: Anesthesia, cleft lip and palate repair, difficult airway, postoperative complications

INTRODUCTION

Cleft lip with or without the palate involvement is a congenital malformation that has a worldwide incidence of 1 in 700 live births (1). Children, especially infants with cleft lip and palate (CLP), have a higher incidence of airway-related complications. Due to their corrupted airways and anatomical defects, they are prone to difficult mask ventilation, laryngoscopy, and endotracheal intubation, as well as other airway complications (2). In a study conducted on airway management, it was reported that airway complications occurred in 7.8% children under anesthesia. Airway complications varied with the type of airway device used, with laryngeal mask airway (LMA) having the highest incidence of 10.2%, followed by endotracheal tube (7.4%) and facemask (4.7%) (3).

There is an increased risk of intraoperative airway and respiratory complications for patients undergoing cleft repair. Recurrent infections of the respiratory tract as a result of continuous irritation and aspiration increase airway reactivity and may result in laryngeal and/or bronchospasm. In another study, Takemura et al. (4) defined perioperative respiratory symptoms as laryngospasm or bronchospasm occurring at induction, increased airway secretions and desaturation (<90%) during maintenance, and respiratory symptoms immediately observed after extubation. In addition to craniofacial abnormalities, congenital cardiac disease, central nervous system abnormalities, mental retardation, and seizures are the most common abnormalities that worsen the physical status and complicate the management of anesthesia.

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METHODS

After obtaining approval from the institutional review board, the records of patients who underwent cleft lip and palate (CLP) deformities from January 2014 to December 2016 were reviewed by evaluating them on the basis of anesthesia records in the post-anesthesia care unit's (PACU's) case sheets at a single center. Patients' written informed consents were obtained from their parents in strict accordance with the principles set by the Declaration of Helsinki.

A total of 31 patients were operated in the abovementioned duration, but we were only able to review 29 cases in the final evaluation due to 2 missing case reports.

The recorded data include demographic parameters, patients having cleft lip, patients having micrognathia, associated syndromes, associated congenital abnormalities, difficult mask ventilation, difficult intubation, anesthesia duration, number of intubated patients in the PACU, airway complications, and intraoperative and postoperative complications.

This was a hospital-based study where trained anesthetists and surgeons were available. Anesthetic management and surgeries were performed by the same team with experience of over 10 years.

Anesthetic Management

Preoperative fasting was 2 h for milk and 4 h for solid food. All the children were premedicated with 0.05 mg/kg midazolam. Baseline vital parameters of the heart rate, noninvasive blood pressure, and pulse oximetry were recorded in the operating room. Propofol (2 mg/kg) was used for the induction of anesthesia. After ensuring mask ventilation, intubation was carried out with rocuronium at a dose 0.5 mg/kg. After confirming bilateral equal air entry, the tube was fixed in the center of the lips. Anesthesia was maintained with 50% air in oxygen with sevoflurane. Vital parameters were monitored throughout the procedure. Ringer lactate was intraoperatively infused at 10 mL/kg/h. The reversal of anesthesia was achieved with 0.05 mg/kg neostigmine with 0.01 mg/kg atropine. Children were shifted to the PACU for observation and vital monitoring for one day; if the hemodynamics were stable, they were transferred to the pediatric ward. Any adverse event during anesthesia was recorded. Desaturation was considered to be a fall in oxygen saturation of <90%, and laryngospasm, a partial or complete airway obstruction with a fall in oxygen of <90%; the presence of a wheeze was defined as bronchospasm. Bradycardia was defined as the situation when the heart rate was <20% of the baseline value and tachycardia, if the heart rate was >30% of the baseline value. A fiber optic laryngoscope was kept ready in the case of a failure of intubation after three attempts.

Main Points:

- Cleft lip and palate (CLP) is one of the most commonly seen craniofacial abnormalities in children.
- Anesthesia management for these surgeries is challenging due to the emergence of airway problems and perioperative complications.
- Anesthetic management needs detailed monitoring and postoperative care with skilled personnel to minimize perioperative complications in a multidisciplinary setting with a team approach.

Statistical Analysis

The differences between the two groups for categorical variables were tested with the Mann–Whitney U test. The chi-squared test was used for determining the differences between two categorical variables. The Fisher's exact test was used for differences between the small groups with categorical variables. All the analyses were performed using Statistical Package for Social Sciences (SPSS Inc.; Chicago, IL, USA) version 17.0 for Windows with a 95% confidence interval level.

RESULTS

A total of 29 patients with the cleft palate were included. Out of these patients, 16 were male and 13 were female. Out of the 29 patients, 15 had cleft lip, 17 had micrognathia, and 10 had both cleft lip and micrognathia. Sixteen patients had syndromes and congenital abnormalities. Three patients had difficult mask ventilation, while seven of them had difficult intubation. Intubation failure was seen in three patients for whom the fiber optic laryngoscope was successfully used. Laryngospasm occurred in two patients, and bronchospasm developed in one patient at induction and was recorded as an intraoperative complication. Airway-associated complications were seen in six patients. Only three of the patients had postoperative complications. Desaturation was seen in three patients, with bradycardia in one patient. No complications related to surgery were observed. There were no mortalities.

A comparison of the patients with and without cleft lip is shown in Table 1.

The demographic parameters, duration of PACU stay, presence of micrognathia, operation duration, intraoperative complications, and airway-associated and postoperative complications did not differ between the patients with and without cleft lip. Systemic diseases and congenital abnormalities were found to be statistically significant in patients with cleft lip (p=0.042). Difficult intubation and intubated patients to be transferred to the PACU included six patients with cleft lip. This finding was statistically significant when compared to patients without cleft lip (p=0.031).

A comparison of the variables between the patients with and without micrognathia is shown in Table 2.

Difficult mask, difficult intubation, intubated patients transferred to the PACU, intraoperative complications, and airway-related and postoperative complications were reported in patients with micrognathia, but they were not reported in the patients without micrognathia.

A comparison of the variables between the patients with and without congenital anomalies is shown in Table 3.

The presence of a cleft lip was seen as statistically significant in patients with a congenital anomaly (p<0.042) (Figure 1).

Table 1. A comparison of the variables between the patients with and without cleft lip

	Without cleft lip (n=14)	With Cleft Lip (n=15)	p
Gender, n (%)			
Male	6 (42.9)	10 (66.7)	0.198[a]
Female	8 (57.1)	5 (33.3)	
Age, mean (SD)	1.71±0.82	1.53±0.52	0.715[b]
Duration of PACU stay, mean (SD)	1.14±0.53	1.13±0.52	0.983[b]
Weight, mean (SD)	10.00±2.15	9.40±1.55	0.591[b]
Presence of Micrognathia, n (%)	7 (50.0)	10 (66.7)	0.362[a]
Syndromes, n (%)	5 (35.7)	11 (73.3)	0.042[a]
Congenital anomaly, n (%)	5 (35.7)	11 (73.3)	0.042[a]
Difficult mask, n (%)	–	3 (20.0)	N/A
Difficult intubation, n (%)	1 (7.1)	6 (40.0)	0.031[c]
Duration of the operation, mean (SD)	151.43±46.22	151.33±52.49	0.813[b]
Intubated in PACU, n (%)	1 (7.1)	6 (40.0)	0.031[c]
Intraoperative complications, n (%)	1 (7.1)	3 (20.0)	0.305[c]
Airway complications, n (%)	1 (7.1)	5 (33.3)	0.099[c]
Postoperative complications, n (%)	1 (7.1)	2 (13.3)	0.527[c]

[a]Chi-squared test, [b]Mann-Whitney U test, [c]Fisher's exact test
PACU: post-anesthesia care unit

Table 2. A comparison of the variables between the patients with and without micrognathia

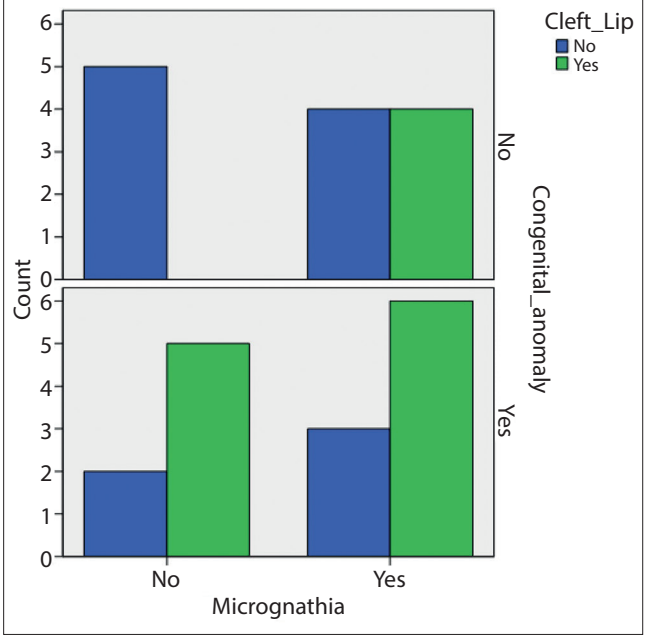
	Without Micrognathia (n=12)	Without Micrognathia (n=17)	p
Gender, n (%)			
Male	8 (66.7)	8 (47.1)	0.296[a]
Female	4 (33.3)	9 (52.9)	
Age, mean/year/(SD)	1.50±0.67	1.71±0.69	0.444[b]
Duration of PACU/day/mean (SD)	1.00±0.01	1.24±0.66	0.616[b]
Weight, mean/kg (SD)	9.67±1.83	9.71±1.93	0.948[b]
Cleft lip, n (%)	5 (41.7)	10 (58.8)	0.362[a]
Syndromes, n (%)	7 (58.3)	9 (52.9)	0.774[a]
Congenital anomaly, n (%)	7 (58.3)	9 (52.9)	0.774[a]
Difficult mask, n (%)	–	3 (17.6)	N/A
Difficult intubation, n (%)	–	7 (41.2)	N/A
Duration of operation/min/ mean (SD)	161.67±51.32	144.12±46.91	0.325[b]
Intubated in PACU, n (%)	–	7 (41.2)	N/A
Intraoperative complications, n (%)	–	4 (23.5)	N/A
Airway complications, n (%)	–	6 (35.3)	N/A
Postoperative complications, n (%)	–	3 (17.6)	N/A

[a]Chi-squared test, [b]Mann-Whitney U test, PACU: post-anesthesia care unit

For patients with a congenital anomaly, the rate of the presence of micrognathia was found to be higher in patients with a cleft lip, whereas for patients without a congenital anomaly, the presence of micrognathia rates were similar for patients with or without a cleft lip (Figure 2).

For patients without a congenital anomaly, difficult mask ventilation was seen only in patients with a cleft lip (Figure 2).

Figure 1. Distribution of patients with and without cleft lip with respect to congenital anomaly and micrognathia



Difficult intubation was seen in patients having a congenital anomaly and having a cleft lip. The rates of difficult intubation were seen more frequently in patients with a cleft lip. Difficult intubation was not seen in patients having a congenital anomaly but without a cleft lip (Figure 3).

Difficult mask ventilation was observed in difficult intubation cases, whereas difficult mask ventilation was not observed in cases that were easily intubated (Figure 4).

Figure 2. Distribution of difficult mask

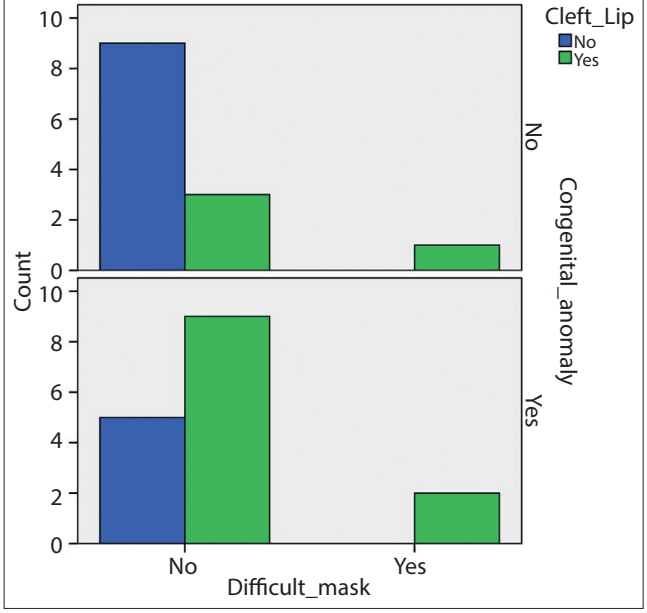


Table 3. A comparison between the patients with and without congenital anomalies

	Congenital anomaly (n=13)	Without congenital anomaly (n=16)	p
Gender, n (%)			
Male	7 (53.8)	9 (56.3)	0.897[a]
Female	6 (46.2)	7 (43.8)	
Age, mean (SD)	1.38±0.65	1.81±0.65	0.101[b]
Duration of PACU stay, mean (SD)	1.00±0.01	1.25±0.68	0.589[b]
Weight, mean (SD)	9.23±1.69	10.06±1.95	0.249[b]
Cleft lip, n (%)	4 (30.8)	11 (68.8)	0.042[a]
Micrognathia, n (%)	8 (61.5)	9 (56.3)	0.774[a]
Difficult mask, n (%)	1 (7.7)	2 (12.5)	0.580[c]
Difficult intubation, n (%)	3 (23.1)	4 (25.0)	0.626[c]
Duration of the operation/min/ mean (SD)	159.23±46.63	145.00±50.86	0.423[b]
Intubated transferred patients, n (%)	3 (23.1)	4 (25.0)	0.626[c]
Intraoperative complications, n (%)	1 (7.7)	3 (18.8)	0.383[c]
Airway complications, n (%)	2 (15.4)	4 (25.0)	0.435[c]
Postoperative complications, n (%)	2 (15.4)	1 (6.3)	0.420[c]

[a]Chi-squared test, [b]Mann-Whitney U test, [c]Fisher's exact test, PACU: post-anesthesia care unit

Figure 3. Distribution of difficult intubation

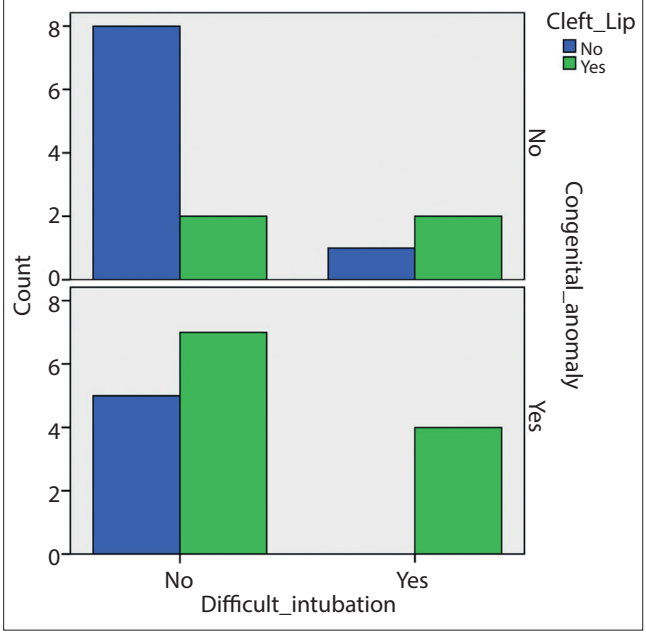
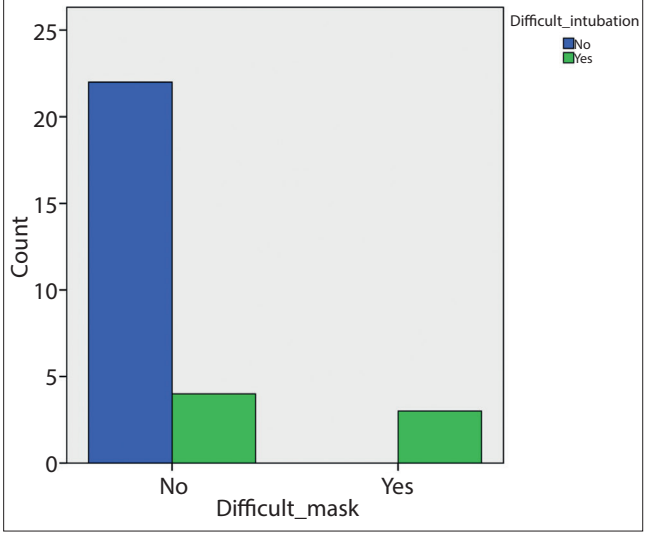


Figure 4. Difficult intubation score



DISCUSSION

Cleft lip and palate deformity repair is a complicated surgery that requires a team approach. Children with a wide cleft palate have an increased risk of prolapse of the tongue into the nasopharynx, causing a serious problem during the induction of anesthesia; at this stage, the assessment of the degree of the airway difficulty is not always possible (5).

In a study, Tiret et al. (6) reported that the anesthesia-related complication rate was 0.5/1000 in children and 4.3/1000 in infants, while Cohen et al. (7) reported higher morbidity rates in children (35%) in comparison to adults (17%). Jindal et al. (8) reported the incidence of failed intubation as 0.16% due to the anesthesiologist's anticipation of a potentially difficult intubation for every patient. Kulkarni et al. (2) reported intubation-related problems in 2.4% cases in cleft repair and 8.7% cases in palate repair. In their study, intubation failure occurred in three patients that suffered from the Pierre Robin syndrome.

In our cases, intubation was successful since a straight-bladed laryngoscope was used after the confirmation of the lungs ventilating bilaterally. Intubation failure was seen only in 3 (10.34%) of the patients who had the Pierre Robin syndrome with micrognathia. The use of a fiber optic laryngoscope facilitated intubation in these patients.

Similar to the studies in the literature, 16 out of the 29 children in our study had Down syndrome (8/29), Pierre Robin syndrome (5/29), Rubinstein–Taybi syndrome (2/29), and Treacher Collins syndrome (1/29); the most commonly observed syndrome accompanying congenital abnormalities was micrognathia, which occurred in 9 children. Encephalocele and meningomyelocele were the other accompanying abnormalities that were recorded in our study.

Fillies et al. (9) reported major complications such as laryngospasm, arrhythmias, and excessive bleeding in 45.2% cases of lip repairs. McQueen et al. (10) reported 31% overall complications in the data reviewed in a two-year period. A majority of the reported complications were difficult intubation, bronchospasm, and airway obstructions. The overall intraoperative complication rate was 10.34% in our study; laryngospasm occurred in 2 patients, and bronchospasm developed in 1 patient at induction. This could be due to the fact that a team of surgeons and anesthetists was working together for more than 10 years on cleft surgeries, and the experience gained over the years would have been contributory.

The postoperative period is very important after lip and palate repair surgeries. Patients with syndromes presented with airway problems, such as mucosal edema of the oropharynx or larynx, because of the prolonged pressure caused by the extension of head and also changes in the oral/nasal airway dynamics (11, 12). Post-operative respiratory complications could occur following the closure of the cleft palate or due to the hypoplasia of the mandible or hematoma. The aspiration of the collected blood or secretions in the nasopharynx is a very important step to avoid complications and to regain reflexes (13, 14). Children should be maintained in the lateral position for air movement and to avoid aspiration. The arms should be restrained to keep them away from the surgical site. Vital signs should be monitored in a well-equipped PACU (15-17).

In our study, we observed postoperative complications only in three children due to transient mucosal edema and oxygen desaturation, which is in accordance with the studies in the literature. All the children were postoperatively monitored in the PACU for a day according to the institution's regimen. Once the vitals were stable with no evidence of bleeding, the children were transferred to a well-equipped ward.

The limitation of our study was that it was based on retrospective assessment. The results may vary among different institutions. Prospective randomized future trials are needed.

CONCLUSION

Surgical repair of CLP in children is challenging for anesthesiologists due to the peculiar variety of anomalies and accompanying perioperative complications. We conclude that anesthetic management needs detailed monitoring and postoperative care with skilled personnel to minimize perioperative complications in a multidisciplinary setting with a team approach.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gaziantep MMT Hospital (Decision date: 25.07.2019, Decision no: 2019/638).

Informed Consent: Written informed consent was obtained from patients.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - E.T.K.; Design - E.T.K.; Supervision - A.M.T.; Materials - A.M.T.; Data Collection and/ or Processing - A.M.T.; Analysis and/ or Interpretation - E.T.K.; Literature Search - E.T.K.; Writing Manuscript - E.T.K.; Critical Review - E.T.K.

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