



Anaesthetic Challenges in Primary Cleft Lip and Palate Surgeries: A Retrospective Study

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Abstract

Background: Cleft lip and palate are one of the commonest congenital craniofacial anomalies. The aim of this study was to do a retrospective analysis of patients who underwent primary cleft surgeries.

Method: After approval from the institutional ethical committee retrospective analysis of 975 patients who underwent primary cleft lip, primary cleft palate and primary combined surgeries was done. The anaesthesia technique and complications were noted from the anaesthesia records. The data recorded was demographic profile, haemoglobin level, preexisting comorbidities, type of surgery and perioperative complications.

Result: The overall pre-existing morbidities, perioperative and post-operative complications were reported in 109 (11.2%), 117 (12%) and 52 (5.3%) participants respectively. In the pre-existing morbidities, Upper respiratory tract infection (URTI) was reported as the most common pre-existing morbidity (6.7%), various syndromes in 32 patients (3.3%). Congenital cardiac condition occurred in 1.2% In the perioperative complications, bronchospasm occurred in 4.1% most of these patients had URI and difficult intubation occurred in 3.3%. Post operatively 1.2% had bleeding and all of these patients had to be intubated postoperatively. It was noted that difficult intubation was more in cleft palate surgery 19 patients than cleft lip surgery 13 patients. Failed intubation occurred in equal number of patients in cleft lip and palate. Post-operative bleeding was also more in cleft palate surgery and post-operative bronchospasm occurred only in cleft palate surgeries

Conclusion: We observed URTI as the major preoperative challenge in addition to intra and post-operative complications. A thorough preoperative evaluation is imperative.

Keywords: Anesthesia; Cleft lip and palate; Endotracheal Intubation; Pierre Robin; Respiratory tract infection; Anaemia.

Introduction

Cleft lip and palate are one of the commonest congenital craniofacial anomalies, considered together, they constitute the third most common congenital anomaly that requires surgical correction at an early age. Cleft lip with or without cleft palate occurs in 1 in 600 live births, cleft palate alone is less common and occurs in 1 in 2000 live births^[1].

Congenital cleft can involve the lip, alveolus, hard and soft palate, can be complete or incomplete, unilateral or bilateral or may be associated with syndromes and other anomalies. These defects of the upper airway predispose the child to difficulty in swallowing, regurgitation of milk, aspiration and subsequent pulmonary infections. Associated syndromes include Pierre Robin, Treacher Collins and Goldenhar syndromes.

Age is a crucial factor in cleft repair surgeries. Most of the protocols favors early surgical intervention for repair of cleft lip at about 12 weeks of age while palatal repair is ideally carried out later between 6 to 12 months of age. We too follow the same protocol. Surgical repair of cleft lip and palate carried out at the appropriate time helps to correct facial deformity, prevents malnutrition and anaemia.

Anesthetic management of the surgical repair of orofacial clefts is quite challenging because of the age of the patient (mostly infants), hematological parameters, recurrent upper respiratory tract infection, malformation of the orofacial tissues, under development, sub-optimal weight, and associated congenital anomalies. Review of literature mentions higher incidence of perioperative respiratory complications when associated with the common cold symptoms in children for cleft repairs^[2,3] In order to determine the type of challenges and perioperative complications during the surgical cleft repair, we conducted a retrospective observational study of 975 patients over a period of 3 years 4 months.

Material and Methods

A retrospective study of 975 patients who underwent cleft lip repair, cleft palate repair and combined (cleft lip and palate repair) from May 2017 to September 2020 was done. A total number of 1067 patients were operated during this period but, 975 patients were analysed and 92 patients were excluded from the study because of incomplete documentation.

The anaesthesia technique and complications were noted from the anaesthesia records. The data recorded was demographic profile, haemoglobin level, preexisting co-morbidities, type of surgery and perioperative complications. For the purpose of statistical analysis, the patients were divided into four groups 0-6 months, 6 months- 2 years, 2-4 years, above 5 years. The data collected was entered in Microsoft Excel and subjected to statistical analysis using Statistical Package for Social Sciences (SPSS, IBM version 20.0). The level of significance was fixed at 5% and $p \leq 0.05$ was considered statistically significant. Kolmogorov- Smirnov test and Shapiro-Wilks test were employed to test the normality of data. Chi square test was performed for quantitative variables.

All the patients were seen preoperatively by the surgeon, paediatrician and the anaesthesiologist. Patients who had raised counts but were clinically asymptomatic were started on prophylactic antibiotics a day before surgery and taken after a decline in count the next day. Those patients with frank respiratory tract infection, wheezing and crepts were deferred for surgery, while those who had running nose and a clear chest were included. Anaemic patients were also not taken for surgery. Out cut off for the haemoglobin level was 8.5 gm%.

Routine preoperative fasting guidelines were followed according to the Smile Train Protocol. Preoperative fasting was observed 4 hours for milk, 6 hours for solid food and 2 hours for clear fluid. No patient received any sedative premedication to avoid risk of airway obstruction After preoxygenation for 3 minutes anaesthesia was induced with I/V fentanyl 2µgm/kg, propofol

1.5- 2 mgm/kg and succinylcholine 1.0-1.5 mgm/kg. The trachea was intubated with cuffed Ring- Adair Elwyn (RAE) endotracheal tube of appropriate size. After confirming proper position of the endotracheal tube, it was taped below the lower lip in the mid line to minimise distortion of facial anatomy. Pharyngeal packing was done with moistened ribbon gauze. Bilateral air entry was again confirmed after final positioning. Anaesthesia was maintained with oxygen, nitrous oxide and sevoflurane and atracurium 0.5 mgm/kg on controlled ventilation. Standard intraoperative monitoring included ECG, SpO₂, EtCO₂, NIBP and temperature monitoring. Paracetamol suppository 20mg/kg was put in after induction. At the end of the surgery oral suction was done and pharyngeal pack removed. Residual neuromuscular blockade was reversed with neostigmine and glycopyrrolate in titrated doses. Tracheal extubation was done after return of consciousness, good spontaneous respiration, adequate tidal volume and when protective reflexes were obtained. If the child was below 1 year old or was fasting more than 4 hours 1% dextrose along with the balanced salt solution Ringer lactate was given. To make up this 1% we added 4 ml 25% dextrose to 96ml Ringer lactate to make up 100ml. Children more than 1 year or 10 kg were given Ringer lactate.

Post-operatively, all the patients were nursed in lateral position to optimise airway and to minimise chances of aspiration. Monitoring for bleeding, vomiting or airway obstruction was done. All perioperative and post-operative complications and challenges were documented.

For the study purposes, fall in SpO₂ <90% was considered as desaturation, laryngospasm as partial or complete airway obstruction with fall in SpO₂ <90% with no relief after jaw thrust, chin lift. It was corrected by the use of the airway and 100% O₂ by face mask. Presence of wheeze/rhonchi on auscultation was considered as bronchospasm.

Requirement of more than three attempts at intubation by an anaesthesiologist having

expertise in dealing with paediatric airway was considered as difficult intubation and failure to intubate after three attempts as failed intubation.

Bradycardia was defined as heart rate (HR) < 20% of baseline, tachycardia if HR >30% of baseline, hypotension when mean arterial blood pressure (MBP) <20% and hypertension if MBP >30% of the baseline value. Hypothermia was considered when body temperature was less than 95° F and fever if more than 100° F.

Results

The data collected was entered in Microsoft Excel and subjected to statistical analysis using Statistical Package for Social Sciences (SPSS, IBM version 20.0). The level of significance was fixed at 5% and $p \leq 0.05$ was considered statistically significant. Kolmogorov- Smirnov test and Shapiro-Wilks test were employed to test the normality of data. Chi square test was performed for quantitative variables.

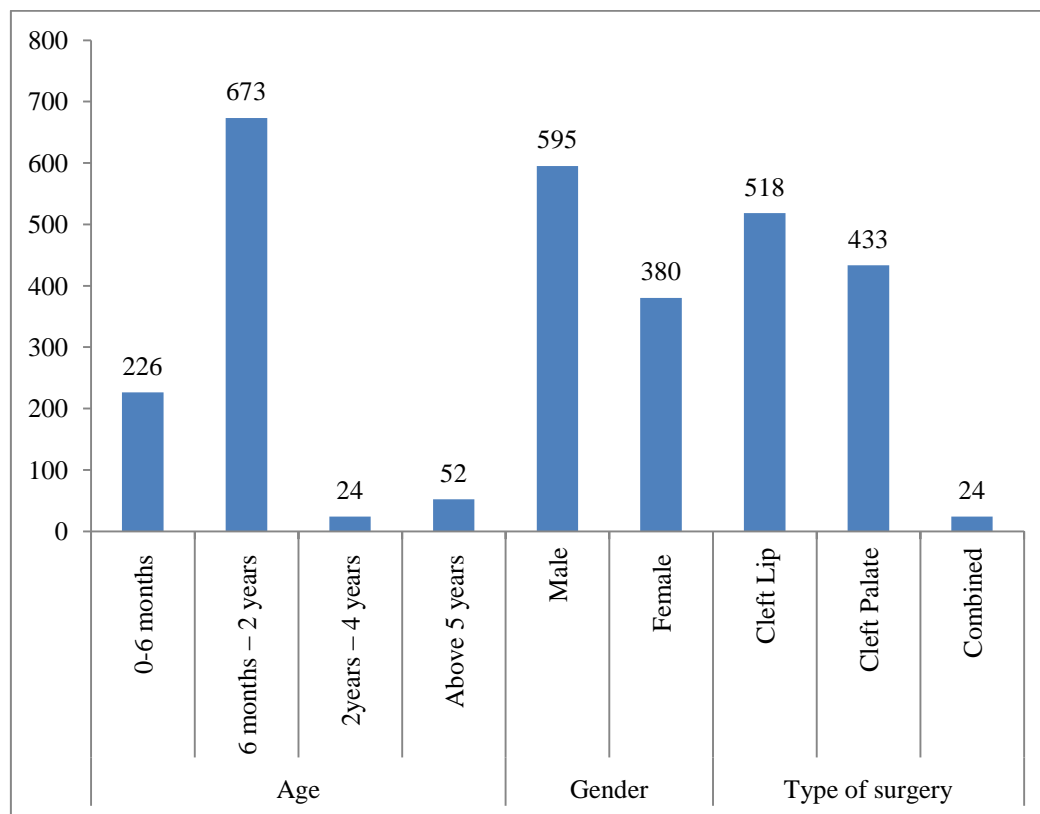
This retrospective analysis was carried out to determine the anaesthetic challenges in primary cleft lip and palate surgeries. The results are based on analysis of 975 participants determining the anaesthetic challenges. The study participants were characterized into different groups and majority of them were in the age group of 6 months-2years (69%). Major proportion of the participants were males (61%) as compared to females (39%) and majority of the surgeries were cleft lip surgery (53.1%), with cleft palate (44.4%) and combined surgeries in (2.5%) (Fig.1).

Our cut off level for hemoglobin was 8.5g/dl Only 25.7% patients had a hemoglobin level between 8.5-10g/dl while majority of Hb was in the range 10-11g/dl reported in 68.3% of the participants and was above 12 g/dl in 5.9% participants. In the pre-existing morbidities (Fig.2) URTI was reported as the most common pre-existing morbidity 65(6.7%), various syndromes in 32 patients (3.3%) of which 28 patients were PierreRobin Syndrome (PRS). In the perioperative complications (Fig.3) bronchospasm occurred in 40 (4.1%) most of these patients had URTI,

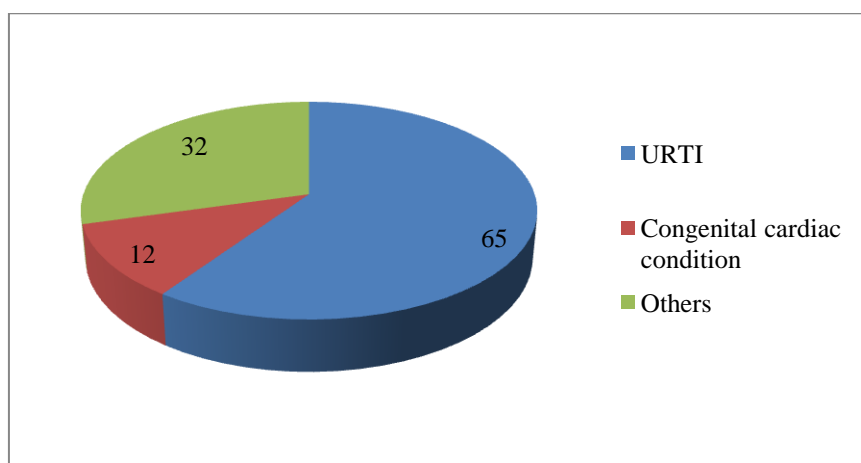
difficult intubation occurred in 32 (3.3%) and most of these children were syndromic. Post operatively 12 (1.2%) had bleeding and all of these patients had to be reintubated postoperatively (Fig.4).

In the association between type of surgery and perioperative complications we noted that difficult intubation was more in cleft palate surgery 19

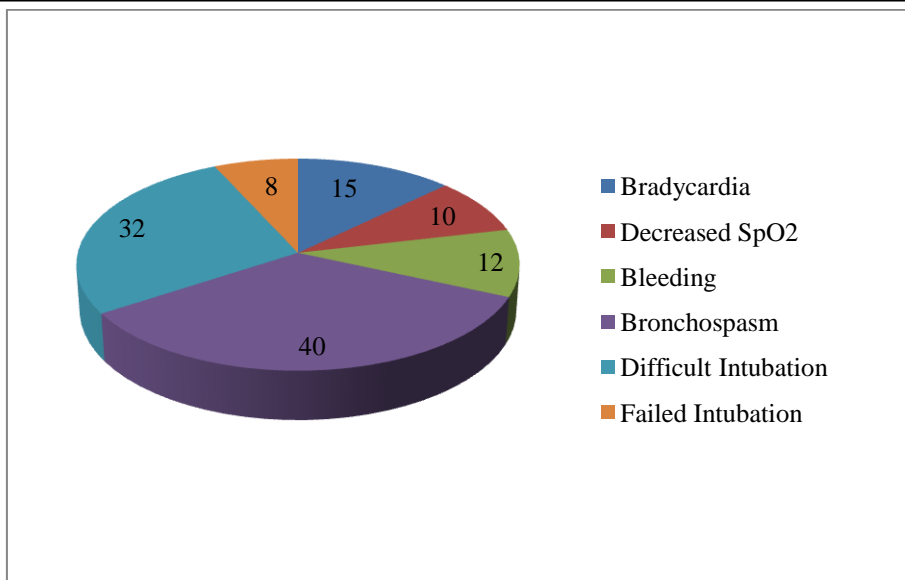
patients than cleft lip surgery 13 patients (Fig.5). Failed intubation occurred in equal number of patients in cleft lip and palate, most of these children were syndromic and had retrognathia. Similarly, post-operative bleeding was also more in cleft palate surgery and post-operative bronchospasm occurred only in cleft palate surgeries (Graph 6)



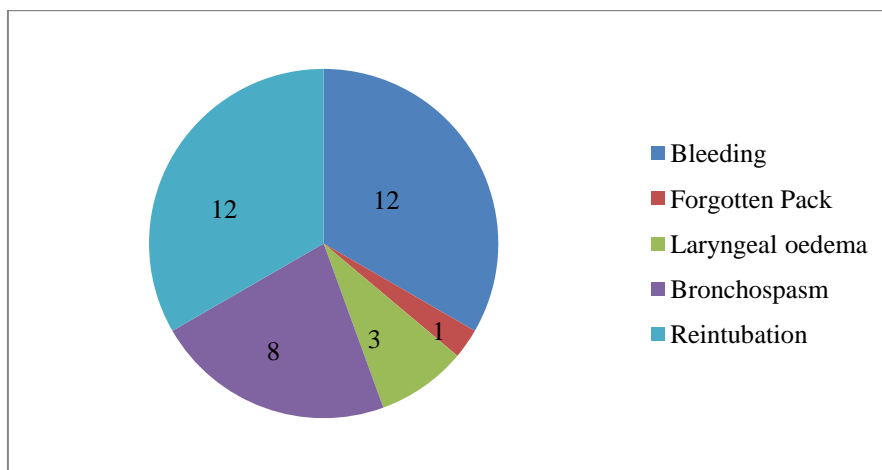
Graph 1: Descriptive characteristics of the study participants



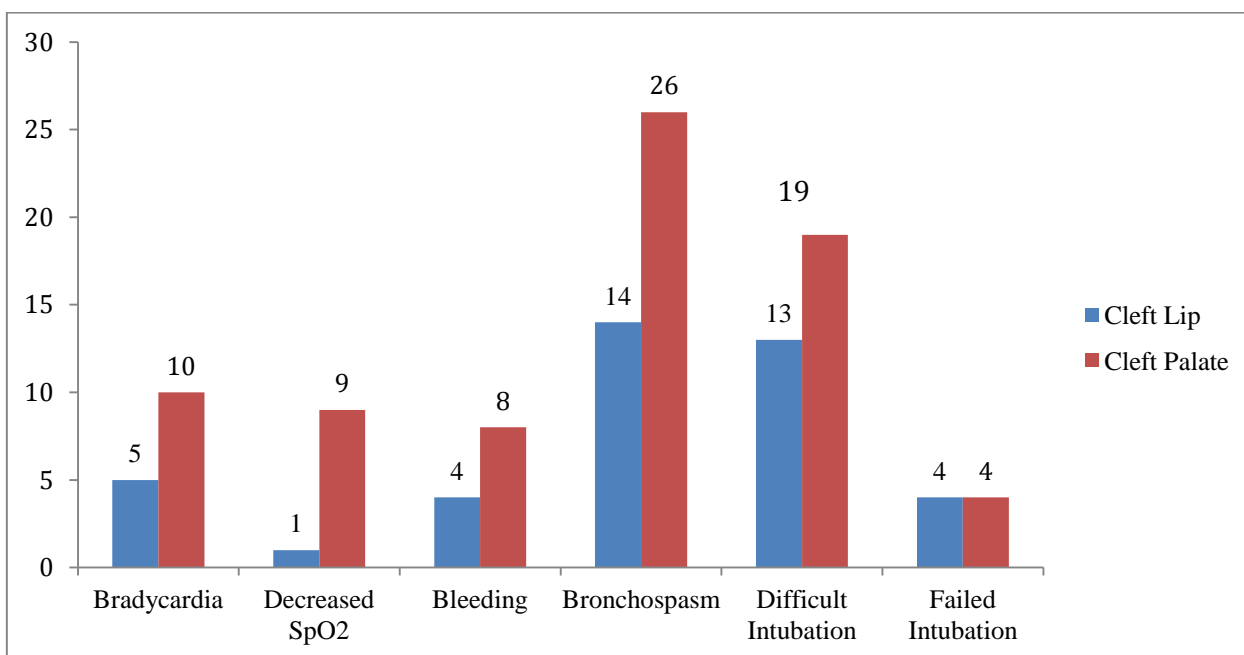
Graph 2: Pre-existing comorbidities among study participants



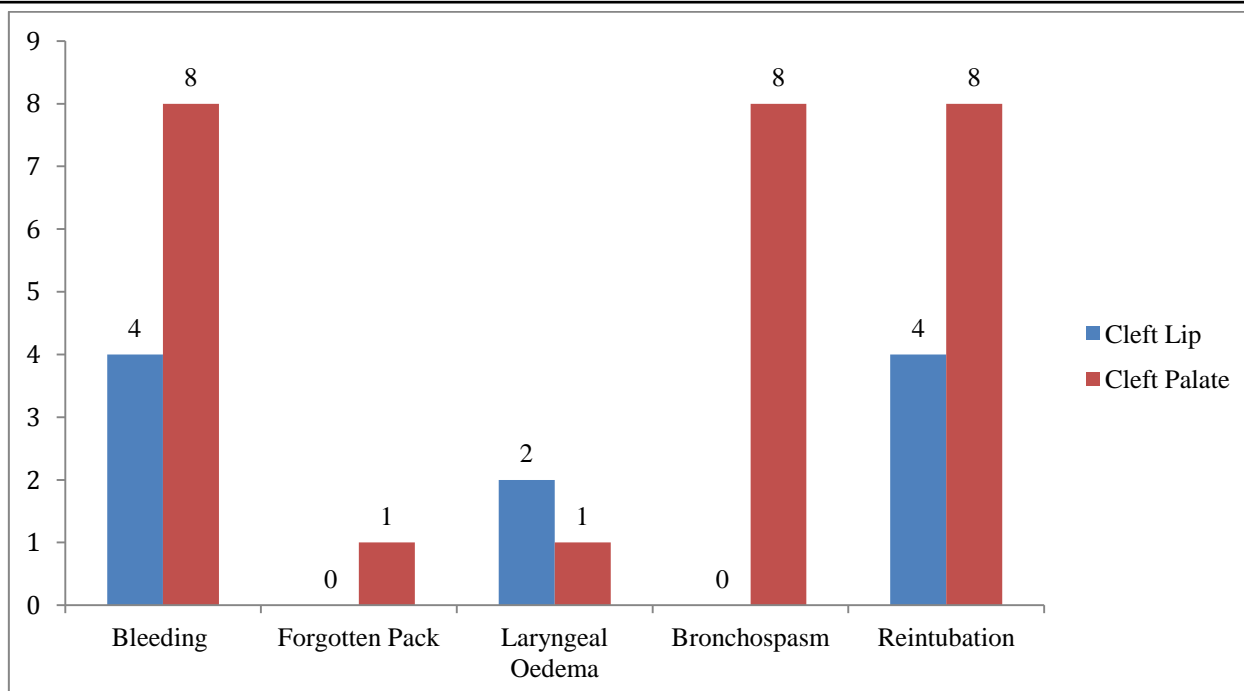
Graph 3: Peri operative complications among study participants



Graph 4: Postoperative complication among study participants



Graph 5: Association between type of surgery with perioperative complications in the present study



Graph 6: Association between type of surgery with postoperative complications in the present study

Discussion

This study made us realise that more than three attempts for intubation is detrimental. Postponement of the case for 6 months led to a better chance of successful intubation in syndromic babies.

975 cleft surgeries were evaluated on the basis of medical records regarding perioperative complications. In our study, the incidence of URTI was 1.43% and 4.10 % in cleft lip and palate cases respectively. It increases the risk of laryngospasm from 1.7% to 9.6% and a threefold increase in bronchospasm in children ^[4]. Turet *et al.* reported incidence of anaesthesia related complications within 24 h in 4.3/1000 infants and 0.5/1000 in children with 0.01% death ^[5]. Cohen *et al.* reported higher peri-anaesthesia morbidity in paediatric patients (35%) compared to adults (17%) ^[5].

Congenital heart disease is common in cleft patients, we had 12 patients with cardiac disease. VSD was most common, 9 patients had VSD, 1 had ASD and 2 were operated Fallots tetralogy. None of these patients had any intra or post-operative complication.

A significant proportion of the anaesthetic morbidity in cleft repair is related to the airway

such as difficult intubation, endotracheal tube compression, disconnection or accidental extubation^[1]. It is not always possible to assess a difficult airway preoperatively. In our study we noted 19 (1.94%) difficult intubations in cleft palate and 13 (1.33%) in cleft lip and failed intubation in 8 patients (0.82%) in cleft lip and palate surgeries. The increase incidence of difficult intubation in cleft palate is because of a wider cleft which was associated with higher intubation grade. Main reason for difficult laryngoscopy is cleft alveolus, protruding maxilla and a high arched palate. Our incidence of airway complications was more in patients having cleft palate repair compared to cleft lip repair. This was also observed by Frilles^[6]

The main limitation of the study was it since, it was a retrospective study, few patients had to be excluded from the study because of incomplete data.

The strength of our study was that we reported a low incidence of failed intubation in spite of associated difficult airway and syndromic babies. The difficult intubation scenario was very well managed by our senior consultants, strict monitoring, optimal positioning, proper external laryngeal maneuver and use of stylet. The routine

practice of reassessing the ventilation after tube fixation, oral packing and application of mouth gag helped in prevention of tube kinking and displacement. Any child with hypoplastic mandible or wide cleft palate increases the risk of tongue prolapse into the nasopharynx and may pose a problem during induction of anaesthesia^[5]. Gunawardhana in his study of 800 cleft lip/palate repairs reported difficult intubation and need for external laryngeal pressure in 86% of cases with Cormack and Lehane Grade III and IV airway grades. The incidence of difficult laryngoscopy was 2.95% in unilateral, 45.7% in bilateral cleft lip and 34.6% in retrognathia with significant association of the lower age with difficult laryngoscopy^[5]. The incidence of difficult intubation (laryngoscopy) Lehan grade II-IV was 2/172 (1.16% in patients with syndromic cleft palate associated with Pierre Robin syndrome. Pierre Robin association is the most common anomaly^[7]. Proper evaluation of the airway is needed for a successful outcome. These patients may also have post-operative ventilation problems because of difficult intubation which may lead to laryngeal oedema. In our study, failure of intubation occurred in 8 cases of which two had retrognathia and six had Pierre Robin syndrome (PRS) with micrognathia. Intubation can successfully be done in most of the cases after 3-6 months. Laryngeal mask airway (LMA) can be used to facilitate intubation in such cases and have been used successfully in craniofacial anomalies undergoing reconstructive plastic surgeries^[8]. We had 32 children who were syndromic in our study out of which 28 were Pierre Robin syndrome. Our study revealed intraoperative bronchospasm in 14 patients (1.43%) of cleft lip surgeries and 26 (2.66%) in cleft palate surgeries. However, there was no bronchospasm in cleft lip surgeries post operatively while in cleft palate surgeries it occurred in 8 patients (0.82%). Laryngeal oedema occurred in 2 patients of cleft lip i.e, 0.20% and in one patient in cleft palate i.e, 0.10%. Recurrent infections of the nasal cavity and respiratory tract due to constant irritation and aspiration increase

airway reactivity and may result in laryngeal and bronchospasm^[9]. Takemura et al.^[3] defined perioperative respiratory symptoms (PRC) as occurrence of laryngospasm or bronchospasm during induction; increased airway secretions and desaturation (<95%) during maintenance and respiratory symptoms observed immediately after extubation. They observed that children with borderline common cold symptoms had a higher incidence of perioperative respiratory complications (23%) during cleft surgeries compared to healthy children with incidence of 4%.

Fillies *et al.* reported major complications such as laryngospasm, arrhythmia, excessive bleeding, hyper/hypothermia in 45.2% of lip repairs and 29.8% in palate repairs respectively^[10]. McQueen *et al.* noted incidence of the anaesthetic complications in 31% of the overall reported complications in the data reviewed during 2005-2006. Difficult intubation, bronchospasm and airway obstruction accounted for majority (76%) of these reported studies^[11]. There is an increased chance of developing post-operative mucosal oedema especially after pharyngeal flap or surgeries lasting longer than 2 hours. Pierre Robin Syndrome is generally associated with respiratory problems leading to difficult intubation which may in turn lead to mucosal oedema. This may further worsen because of the pressure on these structures following extension of head and dissection/manipulation during repair operations^[12,13].

Post-operative respiratory obstruction may be more pronounced especially after closure of a wide cleft, a syndromic child or if there is a forgotten pack. Aspiration may occur of the secretions or blood in the nasopharynx after removal of head extension. There is also change in oral/nasal airway dynamics especially in children with PRS that may result in post-operative respiratory obstruction. Use of nasopharyngeal airway or/and tongue suture to allow forward traction can help in such a situation^[10]. In our study, post-operative laryngeal oedema

and bronchospasm occurred in 11 patients and it was corrected by jaw thrust, chin lift, steroids, oxygen by face mask and bronchodilators. Bleeding occurred in 12 patients and all of these patients required re intubation to see and stop the bleeding.

Quereshi et al^[14] have found hypothermia as a very common complication after long surgeries but in our study, hypothermia was not seen because proper measures were taken like warm fluid and warm blanket intraoperatively.

We did not encounter any respiratory complications in patients with pre-existing URTI. It so it is controversial that a patient with mild URTI can be considered for surgery.

Anaemia (haemoglobin < 9) can be considered for lip surgeries, as it is associated with minimal blood loss.

Conclusion

Anaesthesia for surgical repair of cleft lip or palate in children is challenging because of sharing of airway with the surgeon and preoperative comorbidities. We observed URTI as the major preoperative challenge in addition to intra and post-operative complications. This was more in cleft palate patients. A thorough preoperative evaluation is imperative including a thorough history, proper physical examination and lab investigations. Anaesthesia should be undertaken by skilled anaesthetist with strict monitoring and vigilance.

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