

A study of anaesthetic management of cleft lip and palate surgery in children

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Abstract

Introduction: Anaesthetic management in paediatric patient can present anatomically and physiologically challenges to the anaesthetics. Therefore, surgery of cleft lip and palate in children will require careful consideration and thorough knowledge and clinical application in preparation by the anaesthetics as they are not miniature version of adults.

Objective: To evaluate the anaesthetic outcomes including pre-operative selection of cases, intra-operative and post-operative complications in children underwent cleft lip and palate surgery.

Materials and Methods: 30 patients of cleft lip and/or cleft palate malformation scheduled for surgical repair under general anaesthesia at plastic surgery unit of tertiary care teaching hospital were selected for the study. All patients with age more than 3 months; weight more than 5 kg; no history of URTI / fever; normal chest x-ray; and leukocyte count less than 10000/cum, were included in the study. The patient's haemoglobin less than 10 gm% were excluded from the study.

Results: A majority of patients (22, 73.33%) belonged to less than 3 years of age. Patients were divided in 2 groups with 15 patients in each group according to induction technique. Group I which was induced by inhalation technique with Oxygen, Nitrous Oxide and Halothane and group II which were induced by intravenous Ketamine and Succinylcholine. Intubation was difficult in one patient of Group II. Increased intratracheal secretion occurred in 2 patients of Group II. Laryngospasm was found in 1 case of group II and there was also vomiting in 1 case of group II.

Conclusion: A favourable outcome can be expected in cleft lip and palate surgery in children by adequate understanding of the anatomy, physiology, and psychology of the paediatric patients; and proper selection and through pre-operative assessment and preparation.

Keywords: Cleft lip and palate, Laryngospasm, Vomiting, Anaesthetic management.

Introduction

Cleft lip and palate (CLP) is one of the commonest congenital deformities found in the new-born because of failure in fusion of maxillary and premaxillary processes and palatal processes.¹ Among all congenital anomalies, cleft lip and palate are the most common congenital anomalies amenable to surgery. Surgery aims to restore form and function and modern techniques can leave many defects undetectable.² These patients are prone for chronic respiratory infection due to mouth breathing, malnutrition and anaemia due to deficient sucking and there may be association of other congenital malformations.³

The surgery for CLP usually performed in the baby of three months of age or more. The anaesthesia technique is dependent on the difficulty of the airway. The anaesthetics require knowledge of the paediatric airway and of this particular anomaly and skill in the thorough preparation of the equipment used for intubating a baby for this procedure.⁴ Careful anaesthetic management is an essential part for successful surgical management of repair of CLP. But anaesthetic procedure in this surgery produces unique complications due to anatomical deformities in patients with CLP. These complications include, difficult airway inadvertent extubation; kinking of endotracheal tube; aspiration of blood and secretions; laryngospasm; bronchospasm; and acute airway obstruction.⁵

Anaesthetic management in paediatric patient can present anatomically and physiologically challenges to the

anaesthetics. Children are not miniature version of adults and some of the disease conditions are often exclusively present in them. Therefore, surgery of cleft lip and palate in children will require careful consideration and thorough knowledge and clinical application in preparation by the anaesthetics. This study was carried out to evaluate the anaesthetic outcomes including pre-operative selection of cases, intra-operative and post-operative complications in children underwent cleft lip and palate surgery.

Materials and Methods

A prospective study was carried out at a tertiary care teaching hospital. The study was approved by the Institutional Ethics Committee. Prior written and informed consent of patients were taken for inclusion in the study. 30 patients of cleft lip and/or cleft palate malformation scheduled for surgical repair under general anaesthesia at plastic surgery unit of hospital were selected for the study. All patients with age more than 3 months; weight more than 5 kg; no history of URTI / fever; normal chest x-ray; and leukocyte count less than 10000/cum, were included in the study. The patient's haemoglobin less than 10 gm% were excluded from the study. In addition to the standard preoperative history and examination, special care was taken in assessing the associated congenital abnormalities; congenital heart disease, like, chronic rhinorrhoea, chronic airway obstruction/sleep apnoea, right ventricular hypertrophy and cor pulmonale, anticipated difficult

intubation, nutrition/hydration. All the patients were given inj. glycopyrrolate in dose 0.01 mg/kg intravenously 10 minutes before induction.

Patients were induced by either inhalation technique with Oxygen, Nitrous Oxide and Halothane or by intravenous Ketamine and Succinylcholine. In inhalational technique anaesthesia was induced by using the Jackson-Rees modification of Ayre's T-Piece system with Rendell -Baker face mask of suitable size for the child.

The gas flow maintained at 2.5 to 3 times the minute volume of the patient. Initially gas flow of mixture of 70% nitrous oxide and 30% oxygen was given. Halothane was then started at 0.5% concentration and gradually increased by 0.5% up to a concentration of 2.0-2.5%. This was maintained until jaw and other muscles were relaxed. Respiration was regular, conjunctival and eyelash reflexes were absent and the eyeball was central in position with fixed pupils. In intravenous technique; venepuncture was done using an intracath of appropriate size and an intravenous infusion line was set up. Titrated dose of inj. Ketamine was given in a dose of 1-2 mg/kg body weight slowly until the child was asleep, followed by injection succinylcholine chloride 1 mg/kg body weight. IPPV was given with 100% oxygen using Jackson Rees modification of Ayer's T-piece for children below 20 kg weight and Bain's circuit (Mapleson D) for children 20 kg weight with an appropriate size of face mask.

Then endotracheal intubation was done using Macintosh laryngoscope in younger patients and Magill's laryngoscope with small blade in older children. RAE tubes were used in all 30 cases. Correct size of the endotracheal tube for the age was selected from the following formula,

$$\text{No. of lube} = [(\text{Age}/3) + 3.5] \pm 0.5$$

Other two tubes, one smaller and the other bigger than the calculated size for the patient were also kept ready. They were lubricated with 2% xylocaine jelly.

For intubation head was little raised over folded towel so that the neck was flexed and the head extended to give satisfactory position for intubation. In some cases, the larynx was depressed by an assistant in order to visualize the glottis. In children with complete cleft of the alveolus, laryngoscopy was made easier by placing a pad of gauze piece in the cleft to prevent slipping of laryngoscope blade into the cleft. Tube was fixed in the midline by taking a stitch with sterilized silk below the lower lip. A moist peritubal pack was inserted under direct vision. Neosporin eye ointment was applied to both eyes. After the patient was draped and Doll's mouth gag was inserted in palate repair, air entry was checked again.

General Anaesthesia was maintained in both the groups with oxygen, nitrous oxide, and halothane with assisted ventilation. Continuous monitoring of ECG, Pulse, BP and respiratory rate were done at frequent intervals. Both palates and lips were given Inj. Fentanyl 1 µg/kg for analgesia. Blood loss was measured in suction bottle and gauze soaked and adequately replaced by appropriate fluid / blood. Fluid replacement was done in all patients according to Holiday and Segar's formula: (i) for 0-10 kg: 4 ml/kg/hr; (ii) for 11-20 kg: 40 ml/hr + 2 ml/kg/hr for each kg over 10 kg; and (iii) 21 -70 kg: 60 ml/hr + 1 ml/kg/hr for each kg over 20 kg.

Extubation was done in all patients after 100% oxygen, removal of pack and return of consciousness with protective reflexes intact. The children were transferred in semi-prone or lateral position.

Vitals were checked at regular intervals continuous monitoring of tongue swelling associated with mouth gag blade, subglottic edema, flap edema, increased oral secretion, posterior displacement of the tongue, laryngospasm, vomiting, bronchospasm, aspiration and any other complications.

All the relevant information related to patients' demographic characteristics, radiological investigations, laboratory investigations, surgical procedure, anaesthetic procedure, pre-, intra- and post-operative events were recorded in a case record form. The data was analysed using descriptive statistics as frequency and percentage for the qualitative variables, mean and standard deviation for the quantitative variables.

Results

30 children between age of 3 months to 15 years under going surgical repair of cleft lip and cleft palate deformity under general anaesthesia by plastic surgery unit were included in this study. 14 patients (10 males and 4 females) were for lip repair and 16 patients (7 males and 9 females) were for palate repair. (Table 1) Out of 30 patients majority of patients (22, 73.33%) belonged to less than 3 years of age. (Fig. 1)

23 patients have haemoglobin between 10-12 gm % and 7 patients have haemoglobin more than 12 gm%. No patient was suffering from any other congenital malformation or cardio respiratory disease. Out of 30 patients, 15 patients in were induced by Inhalation technique with Oxygen, Nitrous Oxide and Halothane (Group 1) and 15 patients were induced by Intravenous Ketamine and Succinylcholine. (Group II) (Table 2)

Intubation was difficult in one patient of Group II. Obstruction due to kinking of tube or by pressure of gag or tube displacement (endobronchial or extubation) while giving position was not observed in any patients. Changes in heart rate and rhythm were checked after infiltration of adrenaline in palate surgery. No significant changes were noted any patients. None of the patient required blood transfusion as there was not significant blood loss. (Table 3)

Average duration of anaesthesia in cleft lip was 47 minutes and in cleft palate repair was 82 minutes. During anaesthesia, increased intratracheal secretion occurred in 2 patients of Group II. While, post-operatively, Laryngospasm was found in 1 case of group II and there was also vomiting in 1 case of group II. Patient with Laryngospasm responded well to conventional treatment intravenous hydrocortisone and 100 % oxygen. (Table 4)

Table 1: Distribution of patients according to gender (N = 30)

Surgical procedure	Male	Female	Total
Cleft lip repair	10 (33.33%)	4 (13.33%)	14 (46.66%)
Cleft palate repair	7 (23.33%)	9 (30.00%)	16 (53.33%)
Total	17 (56.66%)	13 (43.33%)	30 (100.00%)

Table 2: Distribution of the patients according to groups (N=30)

Groups	Cleft lip repair	Cleft palate repair	Total
Group I	10 (33.33%)	5 (16.66%)	15 (50.00%)
Group II	4 (13.33%)	11 (36.66%)	15 (50.00%)
Total	14 (46.66%)	16 (53.33%)	30 (100.00%)

Group I: Induction with inhalational Oxygen, Nitrous Oxide and Halothane

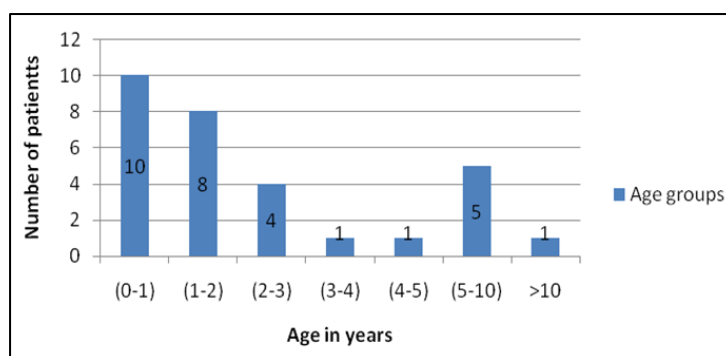
Group II: Induction with intravenous Ketamine and Succinylcholine

Table 3: Blood loss during procedure in both groups

Blood loss	Group I (n=15)		Group II (n=15)		Total
	Cleft lip repair	Cleft palate repair	Cleft lip repair	Cleft palate repair	
Up to 50 ml	9 (30.00%)	0	1 (3.33%)	0	10 (33.33%)
50 – 100 ml	1 (3.33%)	5 (16.66%)	2 (6.66%)	7 (23.33%)	15 (50.00%)
> 100 ml	0	0	1 (3.33%)	4 (13.33%)	5 (16.66%)
Total	10 (33.33%)	5 (16.66%)	4 (13.33%)	11 (36.66%)	30 (100.00%)

Table 4: Complications in both the groups

	Group I (n=15)	Group II (n=15)
Difficulty in induction	0	0
Difficulty in intubation	1 (6.67%)	0
Intra-tracheal secretion	0	2 (13.33%)
Postoperative laryngospasm	0	1 (6.67%)
Postoperative vomiting	0	1 (6.67%)
Any other complication	0	0

**Fig. 1: Distribution of patients according to age (N =30)**

Discussion

Anaesthetic management of paediatric patient during surgical repair of congenital deformities of lip and palate offers interesting challenges to anaesthetics. These children present problems during anaesthetic management specifically related to the nature and site of lesion.

In present study, out of 30 patients, 17 patients were males while 13 patients were females. Cleft lip was more common in males while cleft palate was more common in

females. In a study done by Noorollahian et al. in Iran, it was observed that the incidence of cleft lip alone and cleft palate alone is higher in males and females, respectively.⁶ Similar pattern were also observed in one of the Japanese study.⁷

A majority of patients (73.33%) belonged to less than 3 years of age who were underwent surgical procedure for CLP repair in the present study. A similar finding was recorded in different studies.^{8,9} The optimal timing of surgical repair can vary based on surgeon preference, anaesthetic risks, comorbid congenital anomalies, and perceived psychological

impact on the family.¹⁰ Most surgeons repair the cleft lip around 10-12 weeks of age. According to "The Rule of Order 10" by Millard, the repair of cleft lip should be done in patient with: weight 10 lbs; haemoglobin 10 g/dl; and white blood cell count <10,000 mm³.¹¹ There is clear evidence of greater anaesthetic complications for children under 12 months of age, but there is limited evidence showing greater anaesthetic risk for neonates as compared to surgery at 3 months of age.^{12,13}

Intubation was difficult in one patient of Group II. Obstruction due to kinking of tube or by pressure of gag or tube displacement (endobronchial or extubation) while giving position was not observed in any patients. Changes in heart rate and rhythm were checked after infiltration of adrenalin in palate surgery. No significant blood loss occurred in any patient. During anaesthesia, increased intratracheal secretion occurred in 2 patients of Group II. Anaesthesia for this type of surgery carries high risk of adverse respiratory events.¹⁴ One case each of difficult intubation and failed intubation were encountered in Nigerian study. Intra-operative dysrhythmia was noted in 5% of cases; no life-threatening complication was encountered peri-operatively in that study.¹⁴

Post-operatively, Laryngospasm was found in 1 case of group II and there was also vomiting in 1 case of group II. In a retrospective review of the early complications of primary cleft lip and palate surgery in one Plastic Surgery Unit in UK, there was an overall post-operative complication rate of 26.2%. The life-threatening complications were all related to the respiratory system and all but one of these occurred within 2 days of operation.¹⁵ Complication rate in the present study is comparatively low may be due to low sample size. Complications after cleft surgery are unavoidable clinically. More attention should be paid to the etiologic factors to minimize the prevalence of complications.

Conclusion

Both the inhalational and intravenous induction technique can be used for cleft surgeries as there is no significant difference during induction, maintenance and complications. After analysing the results, it can be concluded that a favourable outcome can be expected in cleft lip and palate surgery in children by adequate understanding of the anatomy, physiology, and psychology of the paediatric patients; and proper selection and through pre-operative assessment and preparation.

Conflict of Interest: None.

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