Review Article

ANESTHETIC MANAGEMENT OF CLEFT LIP AND CLEFT PALATE

M. Adhikari
P. Mukherjee
P.K. Mukherjee

Orofacial cleft is the most common of all facial malformations. The management of cleft lip and palate has long been a major problem in pediatric anesthesia because (*i*) operation is generally done in infancy, (*ii*) malformation makes intubation difficult, but if the patient is not intubated, there is a constant threat to the airway, and (*iii*) it may be associated with other congenital abnormalities(1,2). These patients are usually under-weight and anemic as a consequence of difficulty in feeding. Repeated respiratory infection is common in the group as a whole.

Timing of Operation

The orthodox schedule of treatment of cleft lip is three months of age at about a weight of 4.5 kg and to repair cleft palate at 12-18 months of age(2). In a properly equipped neonatal unit, operation in the lip can be performed in the neonatal period(3), but lip repair at three months allows time for the mother/infant relationship to develop and the baby to grow. Early closure of the cleft (*i*) retracts the protruding premaxilla, (*ii*) improves the infant's feeding ability, (*iii*) helps to placate the emotionally disturbed parents, and (*iv*) suspends development of a possibly emotionally disturbed child. At 12-18 months, the mouth grows sufficiently large to give reasonable surgical access and the palatal shelves develop.

From the Department of Anesthesiology, Institute of Post Graduate Medical Education and Research, Calcutta 700 020 and the Department of Pediatric Surgery, Nilratan Sircar Medical College, Calcutta 700 014.

Reprint requests: Prof. M. Adhikari, AA-25, Sector-I, Salt Lake City, Calcutta 700 064.

Anesthetic Management

Pre-medication

The child can be quietened with syrup trimeprazine orally, 4 mg/kg, two hours prior to operation. The agent has sedative and drying effect and makes induction of anesthesia more pleasant.

Induction

Inhalation of nitrous oxide (N_2O) and oxygen (O_2) together with halothane or cyclopropane is simple and effective, although some anesthesiologists prefer an IV induction. Once the child is asleep, an IV infusion is set up. Intubation can be performed under deep halothane anesthesia, but the use of muscle relaxant provides optimum condition. Before giving relaxant, it is wise to ensure that the facial configuration of the patient allows effective artificial

ventilation with a bag and mask. If the cleft lip is repaired in the neonatal period, before one week of age, intubation may be performed awake(3), because usually before two weeks of age, children do not develop sufficient strength of their tongues and jaws to resist strenuously the introduction of the laryngoscope(4). It is particularly important in children who undergo repair of cleft lip that there should be no trauma of the lips and gums during intubation. A tooth guard made out of several layers of sticking plaster or "Custom made" soft plastic mould not only protects the gum, but also prevents the laryngoscope blade falling into the maxillary clefts.

Endotracheal Tubes

There is a wide selection of endotracheal tubes available to the anesthesiologists. It should be as unobstructive as possible and not distort the tissues. The anesthesiologists demand a secure, nonkinking airway. In operations inside the mouth, the use of one of the various modifications of the Dott's gag provides good access for the surgeon, the endotracheal tube being retained in position by the lower (tongue) blade. The varieties of endotracheal tubes in use are(5): (*i*) a firm thin-walled rubber tube, (*ii*) left-right Magill flexo-metallic tube which is resistant to kinking, (*iii*) plain plastic tube inserted within protective metal shoulders, and (*iv*) Oxford tube with gum elastic bougie as an introducer. Oxford tube with its strengthened proximal segment and built in pharyngeal curve offers greater resistance to kinking than the standard Magill tube. This tube is, however, more difficult to introduce than the gently curved Magill tube, but by using a firm gum elastic bougle threaded inside the tube as an introducer, intubation is greatly facilitated. Oxford tube is tapered. It is, therefore, possible to force a large tube through the glottis and into the narrowest part of the trachea at the cricoid cartilage, which may give rise to laryngeal edema and post-operative croup. Particular care must be taken to select a well fitting tube. A small gas leak is of no significance particularly, as a pharyngeal pack is invariably used in these cases to protect against inhalation of blood. Some surgeons do not use pack in palate surgery; they make the head extended by putting sand-bag under occiput. If blood collects in oro-pharynx, it is sucked out. Cuff tubes are not used in children under ten years of age.

Diameter of the tube (internal) = (age in years/4) + 4.5 = size in mm(6,7). Length of the tube (cm)-(*a*) for oral tube = distance from the incisor teeth to the carina = age in years/2 + 12; and (*b*) for nasal tube = distance from anterior nares to carina = age in years/2 + 15(8).

Usually three tubes, one of appropriate size and one each above and below the expected size are kept ready. A rough clinical guide of the size of the tube is size of the distal phalanx of the little finger of the patient.

In choosing an endotracheal tube, it is useful to note that the wall thickness of the British standard tube remains constant upto and including the 4.5 mm internal diameter. Thereafter the wall thickness is increased, the difference between the internal and external diameters of the tube increasing from 1.2 to 2 mm(9). Oral intubation is usually used.

Endotracheal Connectors

Magill type is suitable, but a special butterfly device attached to it helps in fixing the tube to the chin. The metal end of

the connector is pushed sufficiently into the tube, and this part is kept at the incisor teeth level to prevent biting and also pressure by the gag.

Before commencement of the operation, the anesthesiologist should be positive that the airway is patent, there is no kink in the tube, the tube is not in one lung nor is extubated by extending the head. In cleft palate operation, when the mouth gag is forcibly opened to its fullest extent, note must be made of any difficulty in ventilation. Passing a catheter down the endotracheal tube will test for any suspicion of obstruction. The airway is often improved by placing a small pillow under the shoulders and extending the neck and head, thus preventing acute angulation of the endotracheal tube in the back of the pharynx and tube obstruction on lateral wall of the trachea.

In infants with Pierre Robin Syndorme, the tongue may be sutured to the alveolar ridge of the mandible to relieve the respiratory obstruction. The infant is kept pre- and post-operatively in the prone position for minimal airway obstruction. Only atropine or scopolamine is given for pre-anesthetic medication. Intubation is often very difficult because of small receding mandible, glossoptosis and small epiglottis. Because of this intubation difficulty and the possibility of early respiratory obstruction in neonate and in extremely weak and non-resisting children, intubation may be made awake(1,10).

A small pack is put in the posterior pharynx. This pack (*i*) prevents soiling of the respiratory tract by blood and mucous, (*ii*) anchors the tube, and (*iii*) pushes the tube forward away from the palate.

The attached Magill endotracheal connector is pointed caudal, since the surgeon sits at the head end of the table, anesthesiologists being on the right side of the patient.

Intubation is often difficult if there is (*i*) limited movement of the mandible, (*ii*) marked protrusion of the maxilla and premaxilla complicating the exposure of the glottis, and (*iii*) block of the laryngoscope lumen by tissues as it is lodged in the cleft, usually in bilateral or in right-sided cleft. This is overcome by plugging the cleft with a gauge pack.

It is only by pre-anesthetic evaluation of these handicaps to intubation that the anesthesiologists can intelligently select the anesthetic agent and technique. The inexperienced anesthesiologists will be well advised to use an anesthetic technique, such as halothane anesthesia deep with ether, which will keep the patient breathing and allow longer time for intubation. Following intubation, the connector of the endotracheal tube is strapped with adhesive tape close to the lower lip in the centre of the chin. The best endotracheal connector is one with a port for occasional tracheal aspiration during surgery. The eyes are protected by spreading ophthalmic ointment into them.

Anesthetic Equipment

For children below the age of five years (20 kg) the anesthetic circuit in common use is the Ree's modification of Ayre's T-piece. With a bag attached to the expiratory limb (capacity of which is greater than tidal volume), it can be used both for spontaneous and controlled ventilation. Fresh gas flow 2½-3 times the minute volume should be administered to prevent rebreathing. For children above 20 kg, adult circuit, such as Magill circuit for spontaneous respiration and circle or ventilator for controlled ventilation can be used. For

younger age group Sheffield Ventilator and for older age group Manley ventilator are useful.

Maintenance

Many anesthesiologists assist or control ventilation and maintain anesthesia with N_2O, O_2 and halothane. Ether is still used successfully. Because many surgeons inject epinephrine solution into the operative area for hemostatic effect(1,11,12), the use of halothane has been questioned in the past. Provided hypoxia and hypercarbia are prevented and concentration of halothane is kept low, solution containing adrenaline 1 in 200,000 can be infiltrated along with halothane(13). Controlled ventilation with N_2O and O_2 using non-depolarizing relaxants and/or analgesic is a useful alternative (particularly when there is need to repeat the use of halothane). Trendelenburg position and a throat pack prevents blood from entering the trachea. Blood transfusion during surgery is not customary unless the infant is anemic or the blood loss is excessive as can happen in palate surgery. Conservation of body heat is essential and hypoglycemia should be prevented.

At the termination of surgery, a suture is placed in the tongue (usually after palate surgery) for facilitating tongue retraction in the recovery period. When the infant is almost awake, he is extubated after removal of the pack and careful pharyngeal suction. In pharyngeal flap technique of palatoplasty, some surgeons use pack soaked in benzoin on the raw pharyngeal area to control oozing. The patient is put on his side in a semiprone position, which will protect against aspiration of this blood. Insertion of the oro-pharyngeal airway may cause injury to the repaired palate.

In a young infant, a small degree of laryngeal edema from intubation can cause obstruction to the respiration. The infant, therefore, should be kept in a cold, moist atmosphere, if there are signs of upper respiratory obstruction. These infants cannot suck nipple and hence must be fed with spoon.

In the recovery room, care is concerned primarily with maintenance of a dry, unobstructed airway. One should be cautions about subglottic edema. IV fluids are necessary. Any nausea or vomiting should be controlled. Restlessness and crying initiate hemorrhage, hence he/she should be made quiet with sedative.

Post-operative airway problem is not infrequent, particularly in cases of small mandible, when the effectiveness of the genioglossus muscle is lost and tongue falls back, partially or completely blocking the airway. Nursing of the child in the prone position is usually sufficient, although forward traction of the tongue by means of a tongue stitch may be required in refractory cases.

Acknowledgements

The authors gratefully acknowledge the advice and help rendered by Prof. A.C. Ganguli, previously Professor of Plastic Surgery and Head of the Department of Surgery, Medical College, Calcutta.

REFERENCES

1. Brown TCK, Fisk GC. Anesthesia for plastic surgery. *In:* Anesthesia for Children. Eds Brown TCK, Fisk GC. 1st edn. London, Blackwell Scientific Publications, 1979, pp 220-221.
2. Nixon HH. Head and neck. *In:* Surgical Conditions in Pediatrics, 1st edn. Ed Nixon HH. London, Butterworths, 1978, pp 359-362.

3. Smith RM. Anetshesia for general and plastic surgery. *In:* Anesthesia for Infants and Children, 3rd edn. Ed Smith RM. Saint Louis, CV Mosby Co, 1968, p 324.

4. Smith RM. Endotracheal intubation. *In:* Anesthesia for Infants and Children, 3rd edn. Ed Smith RM. St Louis, CV Mosby Co, 1968, p 159.

5. Wilton TNP, Cochrane DF. Anesthesia for plastic and faciomaxillary surgery. *In:* General Anesthesia, Vol II, 4th edn. Eds Gray TC, Nunn JF, Utting JE. London, Butterworths, 1980, p 1274.

6. Ward CS. Breathing attachments and their components; equipments for pediatric anesthesia. *In:* Anesthetic Equipment, Physical Principles and Maintenance, 2nd edn. Ed Ward CS. London, Bailliere Tindall, 1985, pp 147, 249.

7. Otto CW. Tracheal intubation. *In:* General Anesthesia, 5th edn. Eds Nunn JF, Utting JE, Brown BR. London, Butterworths, 1989, p 517.

8. Kaufman L, Sumner E. Anesthesia for the older children. *In:* General Anesthesia, 4th edn. Eds Gray TC, Nunn JF, Utting JE. London, Butterworths, 1980, p 1525.

9. Brown D. A guide to tracheal tubes. Anesthesia 1969, 24: 620-622.

10. Leigh MD, Belton MK. Operations on the digestive system. *In:* Pediatric Anesthesiology. 1st edn. Eds Leigh MD, Belton MK. New York, The MacMillan Co, 1960, p 344.

11. Musgrave RH, Garrett WS. The unilateral cleft lip. *In:* Reconstructive Plastic Surgery, Vol IV, 2nd edn. Ed Converse JM. Philadelphia, WB Saunders Co, 1977, p 2020.

12. Stark RB. Cleft palate. *In:* Reconstructive Plastic Surgery, Vol IV, 2nd edn. Ed Converse JM. Philadelphia, WB Saunders Co, 1977, p 2097.

13. Wylie, Churchill-Davidson HC. Inhalational anesthetic agent. *In:* A Practice of Anesthesia 5th edn. Eds Wylie, Churchill-Davidson HC. Singapore, PG Publishing Pvt Ltd, 1985, p 200.