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Pediatric Anesthesia for Patients with Cleft Lip and Palate

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Abstract

Cleft lip and palate are the most common craniofacial deformities in the United States of America and México. Their aesthetic and functional implications influence the life-style of the patient: social relationships, school and working performances, self-esteem and health. Surgical repair of the cleft lip is around the third to sixth month of age and the palate repair is when the patient is between six and eighteen months old. There are other surgical repairs during childhood and ideally all of them should be performed by an experienced surgeon teaming up with a pediatric anesthesiologist following the gold standards in cleft care, in a setting where the safety of the patient is paramount.

Keywords: cleft lip, cleft palate, anesthesia

1. Introduction

When anesthetic procedures are performed in cleft patients, there are multiple considerations that have to be taken into account: the actual lip and palate deformities that could lead to a difficult intubation, airway malformations and reactions to the procedure that could lead to laryngospasm or bronchospasm, other malformations or diseases that could alter the prognosis during and after the surgery, the surgical procedure itself that could lead to bleeding or airway obstruction due to swelling, the intubation, the administration of anesthetic medications, the ventilation and use of other medications such as muscle relaxants, pain killers, etcetera, that could alter the homeostasis of the body, and other factors surrounding the anesthetic procedure like the equipment used, the monitoring applied, the site where the surgical act is taking place, the experience of surgeons, anesthesiologists and nurses in charge of cleft care, the

availability of a blood bank and an ICU in case of an adverse event. When all of these factors are well controlled and overseen by an experienced team, the risk for an adverse outcome is significantly reduced. This is why there has been an international consensus for guidelines that will lead the cleft team to successful surgical and anesthetic performances. If the team is visiting a foreign country, they must follow the same gold standards of care contained within these guidelines and work within their scope of practice. If the medical setting that they are visiting lacks the equipment, medications and supplies needed for them to perform at their best, then they should bring the equipment, medications and supplies with them.

2. General considerations

Cleft lip (CL) and cleft palate (CP) are one of the most common congenital anomalies found in the United States and the most common craniofacial anomaly seen by plastic surgeons. Nearly one in five hundred live births will result in a child affected by cleft CL and/or CP. The Center for Disease Control estimates that 2650 babies are born with CP and 4440 babies are born with CL with or without a CP annually [1]. In developing countries, such as México, CL and CP is the most common congenital malformation requiring surgical treatment and its incidence is 1:800 to 1000 live births. Of these, 33% have CL. 64% CL and CP. 2% only present a CP and 1%, rare craniofacial clefts. On average, there are 9.6 new cases per day and 3521 cases per year [2].

In the United States, children with CL and CP are primarily cared for in cleft centers with multidisciplinary teams. Teams consisting of otolaryngologists, plastic surgeons, oral surgeons, speech therapists, occupational therapists, dentists and orthodontists work together to ensure optimal timing and care of these patients. Anesthesiologists also integrate into these teams when surgical procedures are required. Studies from the United Kingdom suggest that children who are cared for by these multidisciplinary teams have improved long-term outcomes with improved feeding, speech, and esthetics [3–7]. For many families, the diagnosis of a cleft occurs during the prenatal period. Prenatal counseling may be the first interaction with the cleft team, facilitating a long relationship with multiple specialists to establish expectations regarding the long-term possibilities for children with CP or CL and CP. There are approximately 139,000 Mexicans who have CL and CP. It is a very important public health problem due to the medical, psychological and social impact to the patients and their family. The causes are multifactorial and can be environmental, genetic or a combination [8].

Infants with CL and CP can have difficulty generating oral suction which can make breast feeding and bottle feeding a challenge. Many infants with CL and CP struggle with feeding and may require special bottles, nipples or education to achieve adequate weight gain. Children without access to support services may endure nutritional consequences, which if not taken care of at an early age, can deteriorate or affect growth and development [2, 9].

The goals for surgical repair of CP and CL repair are to reconstruct the affected area, leading to improved feeding, speech, and function of the nasal airway. CL repair in the United States typically occurs first within 2 to 3 months of age with CP repair occurring between 9 and 12 months [10]. The time between birth and this initial repair allows for a thorough work up of

other co-morbidities and evaluation of any underlying syndromes. In the majority of children with a cleft there are no other associate syndromes or malformations. However, 20–30% of patients will have some underlying syndrome or systemic abnormalities requiring evaluation and potentially treatment prior to repair of the cleft [11]. Isolated CP has the greatest incidence of associate abnormalities while isolated CL is most likely to be an isolated feature. Thus, a thorough pre-operative evaluation by the cleft team is essential prior to surgical repair.

At least 275 different syndromes [12] have been associated with CL and CP. There are a variety of co-morbidities associated with these syndromes. However, cardiac and airway abnormalities represent the primary concerns of the anesthesia teams prior to repair of cleft abnormalities. Syndromes such as Pierre Robin Sequence, Treacher Collins, Goldenhar Syndrome and 22q deletion, are associated with mandibular hypoplasia, potentially making airway management and repair difficult. Cardiac abnormalities are the most frequent associate co-morbidity in children with clefts [13]. Tetralogy of Fallot, atrial septal defect and ventricular septal defect represent the most common congenital heart disease seen in this patient population. A thorough physical exam and imaging with cardiac echocardiogram should be performed for these children. Cardiac abnormalities should be optimized and potentially repaired prior to repair of the cleft itself. Optimization of other co-morbidities, such as airway anomalies, renal dysfunction, nutrition and additional medical issues, should also be a top priority in the months following birth. Children with CP are prone to middle ear effusions and recurrent otitis media. The dysfunction of the palate muscles impairs regulation of the Eustachian tubes, which may increase the risk of upper respiratory infections.

Patients with CP have an increased risk of gastroesophageal reflux and pulmonary aspiration which may contribute to airway reactivity. Speech impairment also occurs due to the abnormal anatomy of the CP musculature and speech development is further hindered in patients with hypoacusia [12]. In México, the multidisciplinary approach is a must in almost all 53 cleft clinics located throughout the country and the role of the anesthesiologist is vital as well as the pediatrician, cardiologist, geneticist, nutritionist, pneumologist, gastroenterologist and all other specialists that may be involved in the preoperative assessment for the patient. Once the patient has undergone the lip and/or palate surgeries, the multidisciplinary cleft team involving the surgeon, orthodontist, speech therapist, otorhinolaryngologist, audiologist and psychologist become very active in providing their services to improve the physical appearance and the functional activity regarding speech, hearing, feeding, and socialization and self-esteem of the patient [14].

3. Consideration of anesthesia management

During surgical repair, a general anesthetic is required to allow for optimal surgical conditions. Control of ventilation through endotracheal intubation is necessary. Given the abnormalities of the face, concern may exist regarding the difficulty of mask ventilation and endotracheal intubation. Both ease of ventilation and intubation might have significant effects on the management of the induction of anesthesia as well as the equipment that should be present prior to induction of general anesthesia. Unlike the adult population, there are not any objective

exam criteria that can help identify a difficult airway. Young children will not participate in the normal airway exam. A difficult airway, defined as a difficult laryngoscopy, intubation or mask ventilation, is less common in pediatric patients [15–20]. However, young age (less than 1 year of age) and craniofacial abnormalities increase the risk of a difficult airway [15].

Although there are not set criteria that is useful to identify a child with a CP who will be a difficult laryngoscopy, examination for retrognathia should occur in each child. Viewing the face from the side is an easy way to identify retrognathia. If retrognathia is present, a potentially difficult intubation should be anticipated, and additional precautions should be undertaken. In the United States, a laryngeal mask airway, video laryngoscope and a fiber optic bronchoscope are tools that could be used to aid with a difficult intubation. If providing surgical care in a resource limited location these tools may not be available. An honest, but thorough evaluation of the facility's capabilities should be performed to ensure that the primary goal of doing no harm to the patient is followed.

Pre-operative history should also focus on determining if the infant has an upper respiratory infection (URI). Patients with a URI are at increased risk for perioperative respiratory events such as bronchospasm, laryngospasms, desaturations, breath holding and postintubation croup [21]. Presence of copious sputum and secretions, nasal congestion, recent URI (less than 2 weeks), and history of reactive airway disease increased the risk of perioperative adverse respiratory events [22]. Patients with CL and/or CP with a recent URI are at an increased risk of perioperative respiratory events compared to children without CL and/or CP who have had a recent URI. To minimize the risk of perioperative respiratory events, it is recommended that surgery be postponed for 4–6 weeks after the URI has resolved and that an experienced pediatric anesthesiologist performs the anesthetic [19]. Despite these perioperative events, in the experienced hands of a pediatric anesthesiologist there is not a risk for substantial morbidity or mortality in these patients. Nonetheless, if these symptoms are present it is prudent to postpone surgery for repair of the CL or CP until the child is no longer ill. Gunawardana and Arteau-Gauthier et al. [23, 24] studied risk factors for difficult laryngoscopy in children with CP. These children did not have any identified syndrome. 5–7% of patients in these studies had difficult laryngoscopy, a higher incidence than in other pediatric patients. Large or bilateral clefts, micrognathia and age less than 6 months were associated with increased incidence of difficult laryngoscopy. Large and bilateral clefts can be difficult because the blade of the laryngoscope can fall into the cleft. Should this occur, one can pack the cleft with gauze to improve the laryngoscopy. No patients in these studies were associated with difficult mask ventilation. Since mask ventilation is not difficult in most of these patients, an inhaled induction with volatile anesthetic with control of ventilation is appropriate in most of these patients in experienced hands.

The preanesthetic assessment is very important and should contain the patient's information: age, height and weight and its main goals are:

- a) To obtain the medical and surgical background of the patient:
 - Family background of anesthetic problems
 - Perinatal background such as pregnancy evolution, kind of delivery, complications during delivery, need of special care after birth, prolonged hospitalization [9].

- Non-pathologic background related with nutritional state and development
 - Review of systems: pulmonary abnormalities including recent respiratory infections, craniofacial deformities that will make airway and respiratory management more difficult [8], cardiac abnormalities and their treatment and cardiovascular evaluation required latest respiratory infection due to the high incidence of fistula formation or palate wound dehiscence [8], or increasing the incidence of complications of the anesthetic procedure (23%). It has been recommended a period of 4 to 6 weeks between the relief of respiratory infection and the surgical and anesthetic event to avoid such complications [25–26]. Another important issue is allergies to medications, food and toys. Kind of malformations the patient has and other anesthetic procedures in the past and the patient's reactions to them.
 - Complete physical examination, including the possibility of difficult venous access and airway.
 - Lab work: complete blood count, prothrombin time, partial thrombin time, bleeding and coagulation times, and any other studies for cardiovascular assessment such as EKG, chest X-rays or echocardiogram [25].
- b) Evaluate the anesthetic risk and decide on the anesthetic technique to be used.
- c) Inform the parents about the anesthetic technique to be used and the possibility of adverse events as well as the amount of time the patient needs to be NPO before the surgery depending on the age of the patient: 2 hours of clear liquids in all ages, to age less than 6 months 4 hours for maternal milk, and 6 hours for non-maternal milk. For patients 6 to 36 months old; 6 hours to solid food and non-maternal milk including formula [26, 14].
- d) Preoperative medications: intranasal dexmedetomidine is great for patients older than 6 months because it diminishes secretions that are produced by crying. It must be administered and be continuously monitored in any setting. Midazolam PO is used to treat separation anxiety before taking the children into the operating room.

No matter the setting where the cleft surgery is going to take place, the anesthetic procedure must have the basic monitoring like continuous evaluation of electrocardiography, noninvasive blood pressure, arterial oxygen saturation, temperature, end-tidal carbon dioxide, with capnography. The objective is to obtain a safe management of the patient and to minimize the complications [9, 27]. When the surgical outreach trips for clefts in children occur in a general hospital not a pediatric hospital, it is important to provide that institution with the appropriate monitors and equipment for the adequate management and safety for the patient.

There is no standard anesthetic that has been shown to be superior in the care of children for repair of CL and CP. Typically, CL are repaired at 2–3 months of age to improve feeding and repair the muscular of the mouth. CP is repaired between 9 and 12 months of age. The goal is to optimize speech development. However, earlier repair could increase the likelihood of midface hypoplasia in the future. No premedication is required for children of these ages undergoing CL and CP repair. At this stage in life, separation anxiety is not yet a major concern. Most children present for surgery from home and have no established intravenous access. Most anesthesiologists utilize an inhalational induction with volatile

anesthesia. If a difficult airway is anticipated, then this induction may be changed. The induction stage is the one with the most risk of adverse events. The main adverse event reported in the literature at the Instituto Nacional de Pediatría in Mexico City is laryngospasm which was noted in 77% of the cases [28]. Once intravenous access is obtained intubation with a RAE (Ring, Adiar and Elwyn) endotracheal tube is used. The pre-formed bend in this endotracheal tube lies on the chin, optimizing the surgical exposure for the surgeon. For a CP repair a throat pack may be used and a Digman retractor is typically placed to further improve surgical visualization. Care must be taken to ensure that the endotracheal tube is not moved when these devices are placed, as endobronchial intubation or inadvertent extubation can occur. In addition, the Digman retractor can compress the endotracheal tube when initially raised. Communication with the surgeons is important to ensure optimal oxygenation and ventilation continues throughout the surgical repair. Multiple anesthesia techniques can be used for the children undergoing CL or CP repair. In the United States, use of a volatile anesthetic with or without opioids or regional anesthesia [29–31] is commonly used. Anesthesia with propofol-remifentanil can also be used with similar anesthetic results [30].

There is an important incidence of adverse events during this stage such as accidental extubation and occlusion of the endotracheal tube by surgical instruments or malposition of the patient. It's also important to mention the laryngospasm and bronchospasm during the palate repair. Hypothermia in patients of two months to two years of age is directly proportional to the length of the surgery and the temperature of the surgical room [27]. In the Instituto Nacional de Pediatría, hypothermia was a frequent concern and it is critical to keep the surgical room at an adequate temperature to avoid other adverse events that could alter the behavior or stability of the patient during the moment of the extubation. To avoid the adverse events such as laryngospasm and bronchospasm it is important to set criteria for the best moment of extubation.

4. Perioperative and postsurgery analgesia

Pain control during the entire perioperative procedure is especially important in CL and palate surgeries. Multi-modal pain therapy with narcotic, non-narcotic and regional anesthesia can help ensure optimal pain control. In the United States, the surgeon will typically inject local anesthetic and epinephrine prior to the repair of both CL as well as CP. The main goal of this injection is to provide vasoconstriction in surgical field. However, when local anesthetic is utilized the patient will benefit from some additional pain control. The duration of which is dependent on the type of local anesthetic used. Opioids can be used intraoperatively to smooth the hemodynamic response to surgical pain. Some anesthesiologists in the United States are increasingly using the short acting narcotic remifentanil. Remifentanil is potent and quick acting, but is metabolized quickly allowing its effects to dissipate quickly. Remifentanil can also be used to facilitate a smooth emergence and extubation in these patients. However, remifentanil may not be available in all facilities throughout the world, making it difficult to utilize in resource limited locations.

Regional anesthesia can provide excellent analgesia in children undergoing surgical repair of CL. The infraorbital nerve provides sensory innervation to the skin on the unilateral skin and mucous membranes from the upper lip through the cheek and to the lower eyelid. Sensory innervation for the nasal alae is also provided (**Figure 1**). Blockade of the infraorbital nerve should provide pain relief for most of the tissue affected by a CL repair. A 2016 Cochrane Review of infraorbital nerve blocks during CL repair demonstrated that bilateral infraorbital nerve blocks result in lower opioid consumption during the surgical procedure as well as lower pain scores in the Post-Anesthesia Care Unit (PACU) [32]. The pain relief was superior to fentanyl [33], placebo [34], and local infiltration [35]. Nicodemus et al. [36] demonstrated that pain relief lasted 19 hours when a mixture of bupivacaine with epinephrine was used for the block. Infraorbital nerve blocks can be easily placed via two approaches; intraoral or extra-oral. The intraoral approach directs a 25 g needle in the mouth and until the gingiva-labial fold near the canine toward the infraorbital notch. The infraorbital nerve emerges from the infra-orbital foramen below the eye which is easily palpated in most patients. Care must be taken to avoid advancing the needle past the foramen into the eye in neonates and infants. Given the small size of these patients, the toxic dose of local anesthesia should be calculated when the surgeon also utilizes local anesthetic with epinephrine for vasoconstriction in the surgical field. Typically, only 0.5–1 mL of local anesthetic is utilized.

The sensory innervation of the palate is more complex than the lip, requiring blockade of the greater palatine, lesser palatine and the nasopalatine. Each of these nerves is branches of the maxillary division of the trigeminal nerve. The suprazygomatic approach to maxillary nerve blockade allows a single injection to provide improved pain control for CP repair [37–38]. Overall, pain was better controlled, and fewer narcotics were required for the first 48 hours following

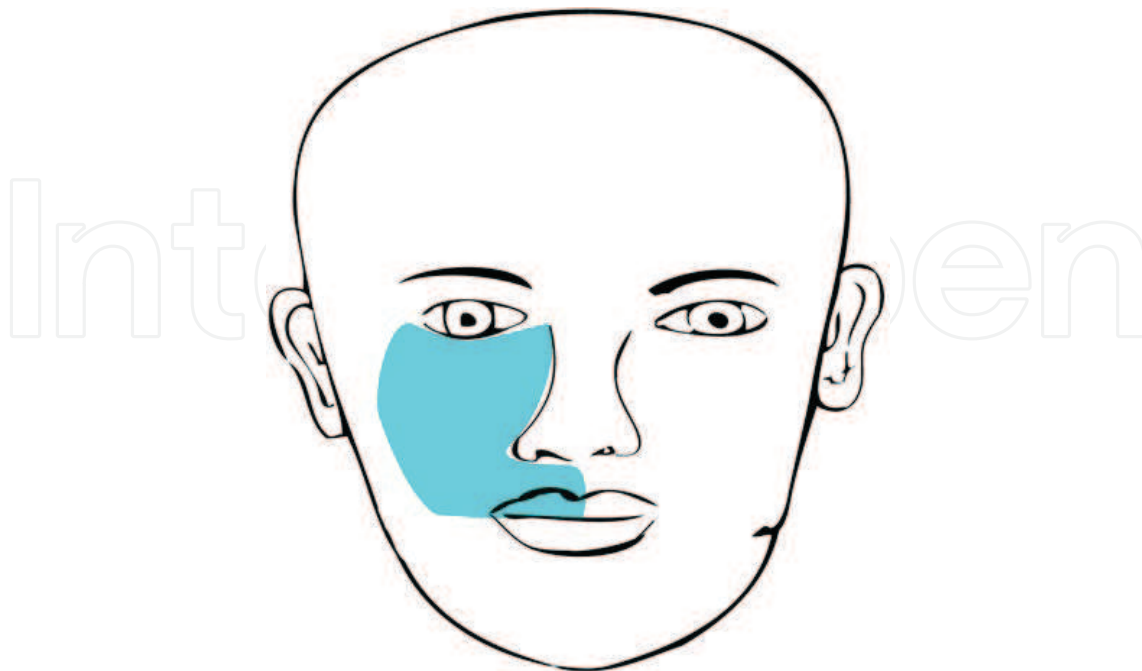


Figure 1. Sensory innervation of the infraorbital nerve.

surgical repair. Unfortunately, suprazygomatic maxillary nerve block is not frequently used due to lack of familiarity by most anesthesiologists in the United States currently. However, unlike infraorbital nerve blocks the nerve block alone is not sufficient to provide adequate analgesia. Typically, narcotics are used in the United States to supplement the residual discomfort.

Multi-modal pain management incorporates the use of non-narcotic medications. Acetaminophen, non-steroidal anti-inflammatory medications and the alpha-2 agonists, like dexmedetomidine, are commonly used in pediatric patients to reduce the total amount of opioids required following surgical procedures, and to reduce the side effects of opioids such as respiratory depression. In infants undergoing primary CP repair acetaminophen is effective in reducing pain scores and overall opioid consumption [39], with intravenous acetaminophen providing the lowest pain scores and lowest opioid consumption compared to placebo and oral administration. Rectal acetaminophen historically has been used given its ease of administration. However, overall opioid consumption is not decreased when rectal acetaminophen is used; suggesting other routes of administration might be preferred [40]. Alpha-2 agonists, such as dexmedetomidine, and ketamine given intraoperatively can also decrease postoperative pain [41].

5. Postoperative care

Postoperatively, there is not a concern for respiratory compromise with CL repair. CP repair differs as obstruction is possible following extubation. The surgical repair itself reduces the size of the airway and excessive sedation from anesthesia and opioids can cause the tongue to lose muscle tone causing obstruction. If the Digman retractor is up for long periods of time, the tongue itself can have some swelling. Obstruction is problematic as blind placement of an oral airway can result in disruption of the fresh surgical repair. Therefore, a plan should be formulated intraoperatively to avoid obstruction in the postoperative period. Dexamethasone is frequently given early during the surgical repair to reduce any swelling. A tongue stitch or nasal trumpets can also be placed by the surgeon following CP repair to relieve obstruction should it result. These techniques are not uniformly used by cleft teams in the United States [42] and there is no increase in reintubation rates when tongue stitch is avoided [43], but it is our practice to place a tongue stitch on all our CP patients. The tongue stitch remains in place while the patient is in the PACU, but is removed before transfer to a medical floor for monitoring overnight.

During the postoperative stage, the main care is based on continuous monitoring the supplementary oxygen depending on the needs of the patient. The bleeding assessment is the proper management of pain and the start of oral intake of clear liquids before allowing the patient to be discharged. It is important to establish which patients are candidates for ambulatory management, which ones have a higher risk to present adverse events like bronchospasm, laryngospasm, desaturation and respiratory difficulty. High risk patients with palate repair could end up having to stay in the hospital or intensive care unit longer than expected and this should be a consideration [28]. It's recommended that the stay at the PACU is 1 hour at least [26]. In the Instituto Nacional de Pediatría in Mexico City, the management of pain after surgery is based on paracetamol at 15 mg/kg or an AINE like ketorolac at 1 mg/kg, and other

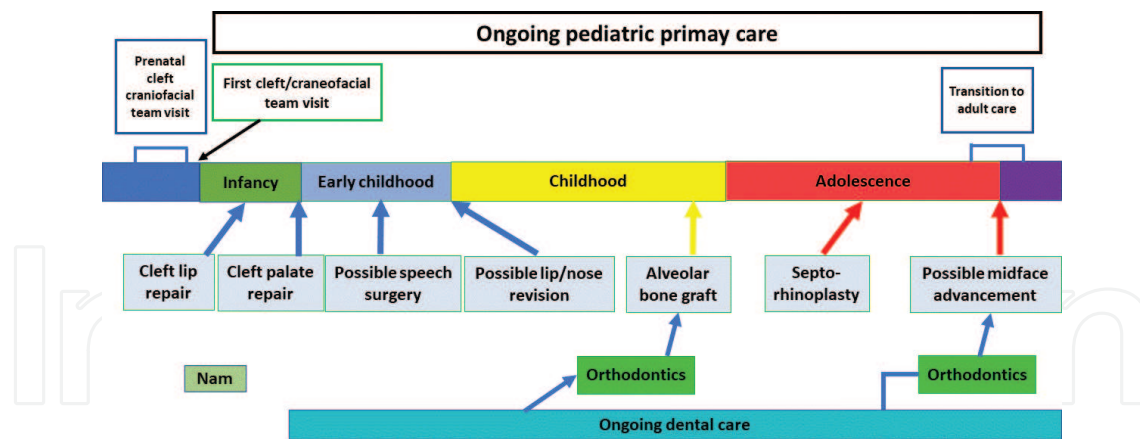


Figure 2. Edited from Lewis CW, Jacob LS, Lehmann CU, AAP SECTION ON ORAL HEALTH. The primary care pediatrician and the care of children with cleft lip and/or cleft palate [44].

options such as a combination of both, or paracetamol with an opioid such as tramadol, or AINE with an opioid. During the surgical outreach trips for clefts, at the surgical setting, there should always be a postanesthetic care unit well equipped to monitor and observe the pediatric patients. The availability of an intensive care unit and a pediatric ventilator should be part of the criteria for any site where one of these trips will take place.

Following the primary repair of CL and CP, children with CP with or without CL have multiple future treatments and potential additional surgical interventions (**Figure 2**).

After multiple surgical procedures, children can be anxious about future procedures. Any past stressful procedure may create lasting difficulty for the future perioperative period. The anesthesiologist should assess for anxiety and create a plan that eases the fears of the patient. In addition, anesthesiologists should be aware of past procedures and what was done. This is especially important following a pharyngoplasty. Nasal intubation following pharyngoplasty can tear or disrupt the past surgical repair. All attempts at nasal intubation should be avoided if possible.

6. The international team of cleft lip and palate

Internationally, there is a need for surgical teams to help aid in surgical repairs of CL and CP. A full discussion of the techniques of establishing sites for these surgical services is beyond the scope of this chapter. However, it is important for the anesthesiologists to recognize differences occur when surgical teams go to other countries. When resources are limited, the choices one makes may differ from the choices made in one's home country. Similarly, a different environment may affect outcomes [45]. Before proceeding with any medical procedures, it is helpful to understand local culture and medical practices. For example, in the United States it is very common that patients receive opioid medications for recovery on the hospital medical floor following surgery. In some countries, the infrastructure and the comfort with postoperative narcotics is not present. Thus, an adapted anesthetic plan should be

implemented to ensure that the ultimate goal of adequate pain relief is met with non-narcotic medications. In these countries reliance in nerve blocks and other non-opioid pain medication becomes valuable (**Table 1**).

The most important idea when surgically treating patients in other countries is to remember to “*first do no harm*.” The pre-operative evaluation becomes vital to ensuring safety in these kids. It is unlikely that an extensive cardiac evaluation may have been done. A murmur on exam or a history consistent with heart failure warrants further workup before proceeding to surgery. Similarly, a difficult airway should not be underestimated when in a resource limited location. If a potential difficult airway is identified, with known risk factors such as retrognathia, young age and a syndrome associated with a difficult airway, an assessment of resources is important. A plan should be made prior to proceeding in case extubation is not possible following the procedure. Finally, a history and physical should thoroughly inquire about the possibility of a current or recent upper respiratory infection. If risk factors for perioperative respiratory complications from the upper respiratory infection are identified, surgical repairs should be postponed.

In general, once appropriate surgical patients are identified, anesthetic care is similar regardless of the location. The medications available and local customs for postoperative care will help shape the anesthetic designed and the plan for postoperative care.

All reconstructive and craniofacial surgeons that oversee cleft care should treat any patient abroad as if they are at their usual surgical facility at home; always following the quality guidelines for their best performance and safety for the patients. There are different protocols for cleft care all over the world, but the visiting surgeon should adapt to the local multidisciplinary team in charge and ensure that there will be the proper follow up for the patients. A complete documentation should be the rule for the entire team working in the operating room. This will simplify preoperative assessment in the future and enable the team to properly evaluate current and future issues that could lead to any adverse outcome and will help

Syndromes associate with CL and CP	Common features
Pierre Robin Sequence	Micrognathia, glossoptosis
Treacher Collins syndrome	Micrognathia, ear defects, congenital heart disease
Goldenhar’s syndrome	Unilateral mandibular hypoplasia, unilateral ear deformity
Down syndrome	Macroglossia, atlantoaxial instability, congenital heart disease
Fetal alcohol syndrome	Congenital heart disease, developmental delay
22q deletion syndrome	Congenital heart disease, hypocalcemia, thymic hypoplasia
Klippel-Feil syndrome	Fusion of the cervical spine, renal disorders
Stickler syndrome	Connective tissue disorder, glaucoma and cataracts, hearing loss, joint hypermobility

Table 1. Shows some syndromes associated with CL and/ or CP and common characteristics.

improve the quality of care provided. All facilities should meet the basic standards to care for all patients, if these standards are not met by the facility, the visiting team is required to bring with them the supplies and equipment necessary to meet these basic standards such as:

1. Electrical power that is dependable and continuous.
2. Working modern anesthesia machines.
3. Dependable oxygen supply.
4. Full-functioning monitoring for each patient in the operating rooms.
5. Working suction should be present at each operating room table and in the recovery area.
6. Basic laboratory and radiology services should be immediately available.
7. Blood banking.

Every team should include a surgeon who is familiar with the planned procedures, preferably a board certified surgeon, a board certified anesthesiologist experienced in the care for children undergoing same or similar procedures, who should be supervising no more than two procedures at any given time, certified nurse anesthetists with experience in the care of children undergoing the same or similar procedures, a board certified pediatrician, operating room, recovery area and ward nurses experienced in the care of children.

The visiting team should always bring the airway equipment including appropriate laryngoscopes and blades, laryngeal mask airways, self-inflating bag-valve-mask in all care areas, emergency cricothyroidotomy kit and fiber-optic bronchoscope. Emergency medications, emergency vascular access kits, defibrillator, portable pulse oximetry, Stat laboratory and portable oxygen supply must be included among the supplies and equipment needed during cleft surgical outreach trip [46].

7. Conclusions

Anesthesia in cleft patients should be performed in a setting with the proper equipment, medications and supplies to provide the safest procedure by experienced anesthesiologists since these patients have high risk for respiratory complications such as difficult intubation, laryngospasm, bronchospasm, or if they have had an upper respiratory infection within the month preceding the surgery, then they may suffer complications like pneumonia or bronchopneumonia. If any other complication may arise from the surgical or anesthetic procedure, the anesthesiologist should be able to diagnose it and manage it and the patient should be transferred to a post anesthetic care unit or intensive care unit, depending on the severity of the complication. Favorable outcomes are directly related to carefully selecting the patient that will undergo cleft surgery, anesthesiologists properly trained to manage this kind of cases and having all the human and material resources to provide the best care during and after the surgical procedure.

Conflict of interest

None of the authors have any conflict of interest.

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