Chapter 16
ANESTHESIA FOR PLASTIC SURGERY
Richard Gillerman, MD, PhD

Anesthesia for cleft lip and palate surgery is common and very rewarding because of the life changing effects these operations have on both patients and their families. The cosmetic benefit of repairing a cleft lip leads to greater acceptance by the local culture, and the improved speech that can occur with a cleft palate repair makes patients and families uniformly grateful for the care provided. This chapter discusses the etiology of cleft lip and palate, the different types of deformities seen, associated co-morbidities, and perioperative considerations for providing safe anesthesia to this group of patients.

Cleft lip and palate dysmorphology is really a collection of deformities that can occur in isolation or together with one another. Moreover, they can occur with other congenital defects that may have a significant affect upon the anesthetic care the patient requires. The exact cause of cleft lip and palate is unknown, though it is probably multi-factorial. There is a genetic predilection to clefting within ethnic groups (Table 16-1).

<table>
<thead>
<tr>
<th>Race/Country of Origin</th>
<th>Incidence/1000 Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Americans</td>
<td>3.74</td>
</tr>
<tr>
<td>Japanese</td>
<td>0.82 - 3.36</td>
</tr>
<tr>
<td>Chinese</td>
<td>1.45 - 4.04</td>
</tr>
<tr>
<td>Caucasians</td>
<td>1.43 - 1.86</td>
</tr>
<tr>
<td>Latin Americans</td>
<td>1.04</td>
</tr>
<tr>
<td>Africans</td>
<td>0.18 - 1.67</td>
</tr>
</tbody>
</table>

Certain genetic syndromes are associated with a cleft lip and/or a cleft palate, but the genetics of clefts that occur when they are not part of a syndrome are poorly understood. While some genes are known to be associated with clefts, further discussion of this subject is beyond the scope of this chapter. Whatever the genetic associations, clefts tend to occur in families.

There also is some association between clefts and a variety of other factors, including maternal hypoxemia during pregnancy, maternal alcohol abuse, use of antihypertensive drugs during...
pregnancy, maternal tobacco smoking, and maternal nutritional deficiencies, such as folic acid
deficiency. Whatever the cause, a defect develops during the 12th week of pregnancy that results
in a partial or complete unilateral or bilateral cleft lip plus or minus a cleft palate.

Why is it important to repair a cleft lip or cleft palate? Some practitioners consider a cleft lip a
cosmetic defect. While it is true that a cleft lip alone, i.e., without any other defects, has no
functional implications, it is also true that children born with a cleft lip are often shunned by
society and frequently teased by other children, making it difficult for them to attend school and
obtain an education. It may be impossible for them to gain employment because of the social
stigma associated with a cleft lip. Repairing a cleft lip during infancy makes it much more likely
that the child will go to school, gain an education, and become employed.

Cleft palate repair, on the other hand, does have functional implications because a cleft palate is
an open passage between the nasal and oral cavities. This opening allows food or liquid to come
out their nose when eating or drinking. This is often very distressing to both the child and the
family. However, the most important and common effect of a cleft palate is its detrimental effect
on speech development. During speaking, it is necessary to place the tongue against the palate to
allow a person to make many language sounds. Absence of an intact palate makes it impossible to
develop those sounds correctly and results in nasal sounding speech. This connection between
the oral and nasal cavities allows velopharyngeal inadequacy, that is, air freely leaks through the
nose during speaking. In addition to the nasal sounding voice, a cleft palate can cause numerous
other errors in speech development.

If the palate is repaired before two years of age, the child has a much better chance of developing
normal speech. Even though an isolated cleft palate cannot be seen, its repair and the subsequent
development of more normal speech have enormous benefit to the patient, their family, and to
society as a whole. The patient who has her/his cleft palate repaired is much more likely to
become a contributing member to society. In fact, repair of either of these defects makes it more
likely that a child will become a contributing member of society as an adult, thereby improving a
statistic called the Disability Adjusted Life Years (DALY) of the country in which the child lives.

Unfortunately, just repairing a cleft lip or palate is not all that is required; it is only the beginning.
Though it will not be discussed in detail in this chapter, it is essential that these patients receive
additional comprehensive services when possible, including speech therapy and dental care, to
achieve maximal benefit from the operation. The remainder of this chapter discusses the types of
clefts and the perioperative considerations for taking care of patients with a cleft lip, cleft palate,
or both.
Cleft Types

There are two primary types of clefts: cleft lip and cleft palate. These deformities can be categorized in several ways, including whether a cleft lip or cleft palate occurs alone or whether they occur together. Clefts can be complete (through all tissues) or incomplete (not through the entire structure). Incomplete lesions of the lip may consist of a simple notch in the vermillion border of the upper lip; a partial cleft palate may consist of only a soft palate notch. In contrast, a complete defect is one where the upper lip extends cleft clear through the vermillion border of the upper lip and may extend into the nose. A cleft lip occurs because the maxillary process and medial nasal process fail to fuse during development. The palate may be cleft from the soft palate all the way forward through the hard palate. The resulting defect may consist of anything from a cleft soft palate, to a hole in the hard palate, to a completely split palate.

Both complete and incomplete clefts can be present on only one side (unilateral), or on both sides of the oral cavity (bilateral). A unilateral cleft lip is far more common than a bilateral cleft lip. The ratio of unilateral/bilateral lesions varies, depending on the ethnic group. Finally, clefts can involve the nose or can be complex in other ways. The following outline categorizes the different types of clefts. Remember that the geographical location in the world and the particular ethnic group affects the incidence of these different cleft types (Table 17-2).

TABLE 17.2: Types of Clefts

<table>
<thead>
<tr>
<th>Cleft Lip</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Unilateral</td>
</tr>
<tr>
<td>o Incomplete</td>
</tr>
<tr>
<td>o Complete</td>
</tr>
<tr>
<td>• Bilateral complete</td>
</tr>
<tr>
<td>Cleft palate (plus or minus a cleft lip)</td>
</tr>
<tr>
<td>• Unilateral</td>
</tr>
<tr>
<td>o Incomplete</td>
</tr>
<tr>
<td>o Complete</td>
</tr>
<tr>
<td>• Bilateral</td>
</tr>
<tr>
<td>o Incomplete</td>
</tr>
<tr>
<td>o Complete</td>
</tr>
<tr>
<td>Cleft nose or other complex cleft pattern</td>
</tr>
</tbody>
</table>
Chapter 16: ANESTHESIA FOR PLASTIC SURGERY

Figure 17-1: Types of Cleft Lips

Upper left – Left lateral cleft lip; Upper right – Complete cleft lip; bottom left – Asymmetrical partial cleft lip; Bottom right – Bilateral cleft lip

Figure 17.2: Types of Cleft Palates

Veau 1 – Cleft palate – Soft palate
Veau 2 – Cleft palate - Complete
Whether these deformities occur separately or together, understanding differences between a cleft lip and a cleft palate procedure is essential to providing safe and effective anesthesia for these patients. Anesthesia for cleft palate surgery has significantly more perioperative considerations, intraoperative issues, and complications than anesthesia for a cleft lip repair. These differences will be discussed in detail in the following sections.

**Preoperative Considerations For Patients with Clefts**

The ideal time to repair a cleft lip is three months of age; the ideal time to repair a cleft palate is about one year of age. Unfortunately, when clefts get repaired often depends on the availability of a surgeon who is qualified to perform the necessary procedure(s), surgeon’s and an anesthetist’s who are comfortable with caring for infants, the availability of funds to pay for the surgery, having someone with whom the family can stay in the town where the operation will be performed, a satisfactory primary care giver (usually a parent), the adequate qualified nursing personnel on the ward, the availability of an “on call” physician, and the availability of a surgeon and anesthesia provider to handle complications after hours. Comprehensive care planning takes into consideration the availability of dental care and speech, and occupational therapy if required. These factors are especially important considerations for cleft palate repair because, if they are not available, surgery to correct these clefts is often delayed beyond the ideal age. Not performing palate surgery at the correct time makes it more difficult for the patient to develop normal speech, even with speech therapy when it is available.

To safely provide anesthesia for cleft lip and palate repair, the anesthetist must be comfortable providing anesthesia for infants and children. Because the surgeon and anesthetist must “share the airway”, especially for a cleft palate repair, the anesthetist must feel particularly comfortable managing the airway and intubating the tracheas of infants and young children during an emergency and under difficult circumstances.

A small percentage of patients who have clefts have a syndrome, and the cleft is part of that syndrome. Depending on the syndrome and its manifestations (phenotype), there may be other significant preoperative considerations that make providing anesthesia challenging. For example, patients with Treacher-Collins or Pierre Robin syndrome often have micrognathia (small jaw) in addition to their cleft, which makes tracheal intubation difficult. Closing the cleft palate of patients who also have micrognathia frequently causes significant postoperative airway obstruction because the patient’s tongue (which is normal size) is now contained in a much smaller space after the cleft palate is closed. Patients with Stickler syndrome can have other craniofacial abnormalities besides a cleft. Other syndromes that have clefts as part of the syndrome usually have fewer perioperative considerations. Patients who have a cleft plus additional dysmorphic features must undergo very careful preoperative evaluation to determine if there are other abnormalities that can lead to anesthesia complications. It may not be clear
from an external physical examination whether there are other manifestations of the syndrome that can complicate the anesthesia and surgery or that can cause postoperative airway obstruction. Undiagnosed congenital heart disease can be particularly problematic. www.ncbi.nlm.nih.gov/omim is a website where free information about syndromes can be obtained.

In addition to the above considerations, patients with clefts may have difficulty eating and have malnutrition and/or anemia. Malnutrition may reduce the plasma protein concentrations, which can reduce the amount of protein available to bind drugs in plasma (plasma protein binding). This increases the amount of free drug available, making more free drug available to tissues, which increases the drug’s effects and the probably occurrence of complications. In addition, malnourished patients may have poor postoperative wound healing and wound break down. Anemia decreases the hemoglobin reserve and oxygen carrying capacity of the blood. Depending on the amount of intraoperative blood loss, patients undergoing cleft palate repair may have insufficient oxygen available to supply the needs of vital tissues and assure wound healing. Therefore, blood must be available for transfusion if necessary.

Particular attention must be paid to a history of airway problems and to examination of the airway. How difficult it will be to intubate the trachea will depend on the malformation and the age at which the patient is undergoing repair. Older patients often have rotated and malpositioned teeth that interfere with placing the laryngoscope blade in the mouth. A bilateral cleft lip, with a prominent prolabium that sticks out, can get in the way of the laryngoscope, making visualization of the glottis difficult. The laryngoscope blade can also ride up into a large complete cleft palate, also making it hard to visualize the glottis. Repeated attempts at visualizing the glottis increase the probability of causing airway trauma. Cleft lip surgery that is only done outside of the oral cavity has fewer airway considerations for both tracheal intubation (bilateral lip excepted) and tracheal extubation. Good airway management skills are required for patients undergoing cleft palate surgery because it is more likely they will have airway obstruction and laryngospasm after tracheal extubation, due to postoperative bleeding, increased airway secretions, and airway edema.

The amount of blood lost and the possible need for red blood cell or whole blood transfusion are significantly greater during and after cleft palate than for cleft lip operations. Because significant blood loss rarely occurs during cleft lip surgery, it is acceptable to perform this surgery in slightly anemic patients (Hemoglobin 8-9g/dl) if he/she is otherwise healthy. Surgeons frequently infiltrate the tissues with local anesthetic containing epinephrine, which further decreases bleeding. In contrast to cleft lip repair, cleft palate repair can be associated with significant bleeding, especially if the patient is more than 10 years of age at the time of surgery or if the malformation the palate is large and the surgery is difficult. As a general rule, patients living below 5,000 feet altitude require preoperative hemoglobin concentrations greater than 10g/dl in
order to proceed with the operation. When the preoperative hemoglobin concentration is above this level, it is uncommon for patients with a cleft palate to require a blood transfusion. However, if significant postoperative bleeding occurs, and the patient must return to the operating room for control of bleeding, the need for transfusion increases. Though the need for a blood transfusion is unlikely, any hospital that performs cleft palate operations must have the ability to quickly provide blood for transfusion.

Preoperative planning for surgery must ensure that age appropriate anesthesia and surgery equipment are available. This includes devices for airway management, such as correct sized laryngoscope blades, oral airways, and masks. Correct size oral RAE tracheal tubes should be used whenever possible to minimize the possibility of tracheal tube kinking and airway obstruction during surgery. These tubes also move the tracheal tube and connectors away from the surgeon’s field. When selecting the correct size RAE tube, both the diameter and location of the bend of the tube must be considered. RAE tubes are manufactured to fit children of average size for a given age, and the bend in the tube is at a specific point in the length of the tube. The distance from the bend to the distal end of the tube might be too short or too long if a patient is larger or smaller than average. This “mismatch” may make it hard to ensure that the tip of the tracheal tube is positioned correctly in the mid-trachea. If RAE tubes are unavailable, a standard tracheal tube may be used and secured in the midline of the lower jaw. However, use of these tubes significantly increases the risk of the tracheal tube kinking as the tube warms to body temperature. Appropriate size suction catheters are required for suctioning through the tracheal tube and for suctioning the oral cavity before and after tracheal extubation. Using a Yankauer suction tip can increase bleeding if the suction tip injures fragile tissues that have just undergone surgery. Other age appropriate supplies required are buretrols that can be placed in line with the intravenous tubing to reduce the possibility of accidently administering too much fluid to infants. Number 22 and 24 gauge intravenous catheters and 1ml and 3ml syringes are also very useful.

Preoperative patient preparation includes a discussion with the patient (when possible) and the family about expectations surrounding the surgery, risks of anesthesia, and the possibility of needing a blood transfusion if the patient must return to surgery for bleeding after repair of a cleft palate. Informed consent should be obtained from the patient (when possible) and/or family for both the anesthesia and surgery. Whether patients should be admitted to the hospital the day of or the night before surgery depends on local custom. In either case, it is important to ensure that he/she has followed the NPO guidelines, especially for solid food (See Chapter 1). The patient should drink as much clear liquids (liquid through which one can read a newspaper – water, juice without pulp) as they desire up to two hours before the induction of anesthesia. Larger volumes of fluid are cleared from the stomach more rapidly than small volumes of fluid. Avoiding dehydration, especially in a warm climate, will facilitate IV placement and decrease the likelihood of developing hypotension during the induction of anesthesia. If halothane will be used as the primary anesthetic, it is especially important that the patient be well hydrated with clear
fluids within the proper time frame to prevent hypotension on induction of anesthesia. For an older child who is particularly anxious, a preoperative anxiolytic drug, such as midazolam, 0.5mg/kg diluted in one-to-two ounces (30-60ml) of soda, may be administered. The maximum dose of midazolam is 20mg.

**Intraoperative Considerations**

Following preoperative evaluation and obtaining consent for anesthesia and surgery, the patient can be prepared for the operating room. It may be helpful, depending on local custom and logistics, to have the parent present during the induction of anesthesia. A parent, if properly prepared for what to expect, can have a calming influence on the child as he/she goes off to sleep. It is important to explain to the parent that the child may struggle, the eyes may roll upwards, her/his breathing may be irregular, and the child will have involuntary movements but that this is common and expected and that there is no pain associated with an inhalation induction of anesthesia.

Unless it is anticipated that the airway will be difficult or that there is a specific reason that an IV will be needed prior to the induction of anesthesia, an inhalation induction of anesthesia, with sevoflurane if available, is usually preferred for pediatric patients. Halothane should only be used for an inhalation induction of anesthesia if the practitioner is very familiar with its use. However, one must be particularly careful about using halothane in small infants if they have been NPO and are dehydrated because halothane has significant cardiac depressive effects and can cause significant bradycardia and decreased cardiac output. The toxic to therapeutic index of halothane is quite narrow, necessitating extreme caution during its use.

After anesthesia is induced, monitors can be applied and an IV can be placed (See Chapter 2). A precordial stethoscope is applied to the chest for monitoring breath sounds and for listening to heart tones. This device is an especially valuable for monitoring ventilation if end-tidal carbon dioxide monitoring is unavailable. If the trachea is to be intubated without giving muscle relaxant, it is especially important to make certain that the patient is adequately anesthetized. If the patient has been anesthetized with sevoflurane, look for conjugate pupils (looking straight forward) that have returned to normal size (no longer dilated), apnea, and normal blood pressure to indicate that the patient is sufficiently anesthetized for tracheal intubation to be accomplished without causing laryngospasm or hypoxemia. When using halothane, a decrease in heart rate, along with the above indicators, are indicative of adequate anesthesia.

Visualization of the glottis and placement of a tracheal tube may take longer in patients with altered anatomy of their mouths, which can increase the likelihood of laryngospasm in patients who have not been given muscle relaxants. When difficulty is encountered or the “depth” of anesthesia is uncertain, the anesthetist must decide whether or not to administer a muscle relaxant to aid with tracheal intubation. While giving a muscle relaxant (other than
succinylcholine) precludes the possibility of the patient rapidly returning to spontaneous ventilation, administration of a muscle relaxant usually makes tracheal intubation easier and safer. The use of succinylcholine routinely for tracheal intubation in infants and small children is controversial and carries some risk of causing arrhythmias, especially bradycardia. This can be a significant problem if the patient is anesthetized with halothane. Some practitioners pre-treat all children with atropine before administering succinylcholine. There is also the theoretical concern that using succinylcholine in patients with an undiagnosed myopathy may cause hyperkalemia and death.

There are several ways to tape a RAE tube in place; surgeons usually request that the tube be secured in the midline and be taped to the lower lip and chin. Remember that the patient will be fully covered with surgical drapes, that the anesthesia provider will have limited access to the tracheal tube and airway, and that the table and patient’s head will be turned 90 degrees; thus, it is important to make sure that all tracheal tube connections are tight and that there is no kinking of the tube when the surgeon expands the Dingman oral retractor. If there is kinking, the pressure needed to ventilate the lungs will increase and the breath sounds and end-tidal CO₂ will decrease. End tidal carbon dioxide monitoring, if available, is particularly valuable for ensuring that ventilation is occurring when there is limited access to the head, airway, and tracheal tube. If the retractor occludes the tracheal tube, the end-tidal CO₂ will go to zero. Use of a precordial stethoscope is very helpful as described above, because the breath sounds will diminish or be absent.

Blood and airway secretions are common during cleft palate surgery. Using a cuffed tracheal tube (when available) decreases the possibility that the patient will swallow blood and have it get into the airway. Often there is no need to place air in the cuff. If the cuff is to be inflated, only sufficient air should be injected into the cuff to eliminate the leak. Using a cuffed tube does not always eliminate aspiration of blood during surgery.

The surgeon will place a throat pack in to the oropharynx to further prevent blood and secretions from ending up in the airway or the stomach. It is important to make certain that when a throat pack is inserted, the surgeon leaves part of the pack outside the mouth so everyone in the operating room can see it and know that the pack is in place. A sign should be placed on the OR table or wall in plain view of everyone stating that the throat pack is in place. Everyone in the OR must be responsible for assuring that the throat pack is out at the end of surgery. There are multiple case reports of airway obstruction after removal of the tracheal tube because the throat pack was not removed at the end of the case. When this occurs, IT IS OFTEN LIFE THREATENING. If the end of the throat pack is not protruding from the mouth, it may be forgotten until the trachea is extubated, and the patient’s lungs cannot be ventilated and he/she is hypoxemic or dies.
During the maintenance phase of anesthesia, it is usually best for patients to breathe spontaneously when possible. If a muscle relaxant is used for tracheal intubation, it is best that the drug not be re-dosed so spontaneous ventilation can resume quickly. Usually a combination of inhaled anesthetic and an analgesic are all that is required for maintenance of anesthesia. Analgesic considerations for cleft lip and palate repair depend on what is available locally and whether or not the surgeon or anesthesia provider performed a nerve block. (See the next section for details.)

Towards the end of surgery, the surgeon often places a heavy suture (2-O silk) in the tongue and tapes the ends of the suture to the cheeks. This makes it possible for the anesthetist or nurses to relieve airway obstruction by pulling the tongue forward. Near the end of surgery, it is also necessary to decide which method of tracheal extubation will be used: awake or anesthetized. No matter which method is chosen, it is necessary to have both the equipment and drugs available for immediate tracheal intubation or tracheostomy should one or the other be required. This is especially important for patients undergoing cleft palate repair, since their risk of airway obstruction is greater following tracheal extubation.

The tracheal tubes of most patients undergoing cleft lip surgery are usually removed when they are awake. Those who have undergone cleft palate surgery are extubated when the patient is awake or when they are still anesthetized. There are pluses and minuses for each form of extubation. Extubating the trachea when the patient is awake significantly decreases the likelihood that he/she will develop laryngospasm after tracheal extubation. This is because the patient has already gone through stage two of emergence. Having the patient awake before leaving the operating room also improves airway muscle tone, ensures a positive gag reflex, and reduces the likelihood that the tongue will cause airway obstruction. For these reasons, extubating the trachea awake is preferred when anesthetists have little experience providing anesthesia for repair of cleft lips and for cleft palates.

Tracheal extubation may occur while the patient is still anesthetized if the surgeon is worried that the patient will cough during the wakeup and start bleeding from raw surfaces of the palate. By extubating the trachea of patients while he/she is still anesthetized, the possibility of coughing on the tracheal tube is prevented and the likelihood of bleeding is reduced. However, the above-mentioned advantages for awake tracheal extubation are absent when the tracheal tube is removed from anesthetized patients. Awake extubation may place the patient at increased risk for airway obstruction and laryngospasm if the anesthetist misjudges the patient’s level of anesthesia and extubates the trachea during “stage two”. Only anesthetists skilled in the airway management of young children, who can quickly “rescue” a patient who develops airway obstruction or laryngospasm, should extubate the trachea of an anesthetized patient. If deep tracheal extubation is planned, a tongue stitch must be in place so the anesthetist can pull on the suture and move the tongue forward to relieve the airway obstruction. It is also helpful to place
the anesthetized child on her/his side following tracheal extubation; this allows the tongue to fall forward, not backward, and minimizes airway obstruction.

It is also important to pay careful attention to the method by which the airway is suctioned during emergence from anesthesia. If the anesthesia provider fails to take meticulous care during airway suctioning during wakeup, he/she can damage or disrupt the surgeon’s repair and cause bleeding or dehiscence of the repair. Thus, when suctioning the airway, it is important to use a suction catheter rather than a Yankauer suction tip and only suction outside the teeth next to the inside of the cheeks or in the midline away from the repair. When suctioning in the midline, care must be taken to avoid disrupting the suture lines, especially following a cleft lip repair. To avoid injury to a palate repair, it is safer to open the mouth and suction in the midline just over the tongue. After suctioning, verify that the palate is appropriately dry and not bleeding. If more than a trace amount of blood is suctioned continuously from the palate, it is preferable to have the surgeon take another look to determine if there is a bleeding site that can be seen and cauterized, even if this means re-anesthetizing the patient. The safest place to deal with a patient whose palate is bleeding is the operating room, not the recovery room or on the ward. It is important to make sure the palate is dry before the trachea is extubated and before leaving the operating room.

**Analgesia Considerations**

**Opioids**

The most appropriate opioid to use during surgery is one that is long acting and causes little respiratory depression, especially if the plan is to have the patient breath spontaneously throughout surgery. At present morphine is our best option. Giving a total dose of 0.1mg/kg every four hours, divided into three or four doses, usually keeps the patient breathing spontaneously. Fentanyl is a poor choice because it only provides 30-40 minutes of pain relief, and in many countries is more expensive. Hydromorphone, a drug that has five times the potency of morphine, is also an acceptable choice. The usual dose of Hydromorphone is 0.015-0.02mg/kg of drug given in divided doses over 2-to-6 hours. The specific dose of drug chosen should depend upon whether or not the patient has had or will get local anesthetic, either by the surgeon or the anesthetist, and whether the patient is also being given non-opioid analgesics. Local anesthesia decreases the need for intravenous opioids. A long acting local anesthetic, such as bupivacaine, when given as infra-orbital nerve block or sphenopalatine block (See Chapter 21) for cleft lip or palate repairs respectively, significantly decreases or eliminates the need for opioid analgesics.

**Non-opioid agents**

*Ketamine* is a good adjuvant to use with opioids because it provides good analgesia without causing significant respiratory depression. However, using ketamine for cleft surgery tends to increase airway secretions in patients who already have significant amounts of secretions.
Nonetheless, Ketamine use significantly decreases opioid requirements. The dose of ketamine is 0.5-1.0mg/kg IV or IM as an adjuvant to morphine.

Acetaminophen can be given orally preoperatively or rectally intra-operatively. The problem with rectal administration of the drug is that very large doses of drug are required, 40mg/kg or more. Half of this dose (20 mg/kg) can be repeated every six hours after surgery. The PO syrup of Acetaminophen can be given preoperatively in a dose of 15mg/kg. Acetaminophen 15mg/kg can also be given intravenously. When Acetaminophen is given intravenously, it must be administered over 15 minutes to avoid causing excessive blood concentrations of the drug.

The use of non-steroidal analgesics, such as oral ibuprofen or intravenous ketorolac is controversial, especially for cleft palate surgery. Some surgeons believe that they increase postoperative bleeding, although the evidence for this belief is poor. Many surgeons accept the intraoperative use of these drugs. They and others accept their use postoperatively if good hemostasis was obtained and the surgical field was very dry at the end of surgery. Communicate with the surgeon and get her/his opinion before administering these drugs.

Local anesthesia can be a particular benefit for patients after cleft surgery. For cleft lips, either local infiltration of the wound or bilateral infra-orbital nerve blocks can be done (See Chapter 21). To have the maximum effect, bilateral infra-orbital nerve blocks are required for cleft lip repairs. These blocks are easy to do and are associated with few complications. Infiltration of local anesthetic into the surgical site or a sphenopalatine nerve block provides good postoperative pain relief after cleft palate surgery. A sphenopalatine block is more difficult to do and should not be attempted unless the anesthetist has been formally trained to perform this block. These blocks are best done at the beginning of the case while the landmarks are clear. This minimizes opioid requirements during surgery, though performing them at the end of surgery provides a longer duration of analgesia.

Post Anesthesia Considerations

There are three main considerations for patients following cleft surgery: ensuring airway patency, being vigilant for postoperative palate bleeding, and controlling pain. The three are related. Palate bleeding may affect airway patency, and continuous crying and screaming due to pain may cause palatal bleeding. If airway compromise requires insertion of an oral or nasal airway or re-intubation of the trachea, the surgical repair can be disrupted. One of the best ways to calm a child after surgery is to have the mother sit at the bedside and hold the child. She can help monitor for bleeding, calm the child, and encourage the child to take oral fluids. She can help prevent the child from touching her/his cleft lip repair. If local custom allows parental visitation in the Post Anesthesia Recovery Room (PACU), it is strongly recommended that this be done.

Following cleft palate surgery, children should be closely observed in the PACU for the presence
of bleeding. If there is significant bleeding, a sponge is placed against the roof of the mouth and light pressure is applied to control the bleeding. By applying gentle pressure, mild bleeding usually stops. Applying too much pressure may disrupt the surgical repair and increase bleeding. However, if there is more than just a small amount of bleeding, or if the bleeding does not stop after applying pressure for 10 minutes, immediate re-exploration of the surgical site in the operating room should be seriously considered. If there is any doubt about the seriousness of the bleeding, it is much safer and better for the patient to explore the wound early rather than wait until later. Delaying exploration of the wound of a bleeding patient until later often results in returning to the operating room in the middle of the night, which is less safe than doing so during the day. It may require persistence and convincing on the part of the anesthetist to get the surgeon to agree that the wound should be explored; thus, it is important that the surgeon is made aware of the bleeding as soon as the amount of bleeding becomes a concern. If bleeding is significant, especially if a return to the OR is being considered, it is imperative that the patient’s hemoglobin be determined. Patients can have significant bleeding that can go undetected if the blood is swallowed rather than leaving the mouth. A type and cross match of packed red blood cells or whole blood should be done if there is any possibility that a blood transfusion will be required. Remember that a “normal” or elevated hemoglobin concentration (higher than before surgery) may be present in patients after significant bleeding, if fluid replacement for the bleeding was inadequate.

When patients are awake, responding to voice and commands, able to maintain a normal oxygen saturation (SpO₂) in room air, and have little pain, they are ready for transfer from the PACU to the ward. Patients who have undergone cleft lip repair can usually have their IV removed in the PACU because they usually take oral fluids readily and are less likely to have postoperative complications. However, the IV of patients who have undergone cleft palate repair should remain in place for the first 24 hours after surgery, because they often take fluids by mouth poorly and because there is a risk of postoperative bleeding. Both of these scenarios require the presence of an IV to provide proper therapy.

Pain control is a significant issue, especially following cleft palate repair, and has been addressed above. Specific medications that should be administered on the ward will depend upon local availability of drugs and sufficient nursing care. Use caution when administering opioids postoperatively, especially to infants, on the ward.

Special Considerations

Surgery to create a pharyngeal flap is a type of cleft palate associated repair that deserves special consideration. The goal of this surgery is to decrease the hyper-nasality of the patient’s speech by restoring velopharyngeal competence or by functionally separating the nasal passages and the oral cavity. However, creating a pharyngeal flap can sometimes cause significant airway
compromise after surgery. This occurs because passage of air through the nasopharynx is often severely restricted by the presence of airway (flap) edema and by a significant decrease in the size of the oropharynx. Following tracheal extubation, the patient frequently unable to breath through her/his nose. This difficulty with breathing can be made worse if opioids given for pain reduce the respiratory rate. Opioids decrease respiratory drive and ventilation, which may lead to hypoxemia and necessitate rapid re-intubation of the trachea; this may be very difficult. Sometimes inserting a nasal airway will provide an adequate airway while the trachea is being re-intubated. At times it is necessary to take down the flap to assure an adequate airway. When pharyngeal flap operations are done, it is essential that all equipment and drugs needed for a rapid re-intubation of the trachea be immediately available prior to extubation. These patients usually require observation in an intensive care unit for the first 24 hours after surgery.

Selected References available on Internet:
1. Genetic Syndromes associated with Cleft Lip and Palate:
2. Somervile, N and Fenlon S; Anaesthesia for Cleft Lip and Palate Surgery, 2005:
   http://ceaccp.oxfordjournals.org/content/5/3/76.full
3. Anesthesia for Cleft Lip and Palate, various authors:
   Cleft lip repair under local anesthesia (video): http://www.youtube.com/watch?