Cleft Lip and Palate Deformity:

A Problem Affecting People Around the World

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Abstract

Cleft lip and palate deformities are abnormalities most commonly seen in third world countries. There are many ways to repair them, but first it is determined whether the cleft is unilateral or bilateral. Then the procedure is uniquely planned for the specific needs of the patient. The cleft can be determined in the prenatal stages by using 3D sonography, so parents can prepare for how to care for a child who has the deformity. The most important details of the repair procedure are agreed upon from surgeon to surgeon, but there are some differences in procedures and recommendations from one surgeon to another. The speech outcome for most patients is positive, but the speech therapy takes extensive work. Overall, the beneficial outcomes make the surgery worth having to increase the quality of life.
Cleft lip and palatc deformities are abnormalities that are seen most commonly in children in third world countries (Murthy, 2009). However, cleft lip and palate malformations are seen in developed countries in children and sometimes adults can be seen with the malformation if they have not had the corrective surgery. In developing countries, some of the children have the deformity repaired by having surgery, but others cannot afford it and have to live with the deformity throughout their whole lives. According to Murthy (2009), there are patients from the ages of a few days old up into the late 40s who have the corrective surgery for cleft palate and lip. This range in age is due to many different factors, such as financial issues, lack of doctors, and of knowledge about cleft lip and/or palate procedures and the problems that they can cause. In developed countries, on the other hand, it is very uncommon to find an adult who has an un-operated cleft lip and/or palate, due to the advancements in medical services throughout these developed countries and the fact that the patients themselves have more knowledge about the deformities. Typically, if there is an adult who has not had the reconstructive surgery to correct the cleft lip and/or palate, that person can still schedule the surgery later in life. However, adults must go through a different procedure due the fact that they have undergone more growth than that of a younger patient. The procedures differ from patient to patient because each situation comes with unique circumstances that need to be taken into consideration. The procedure for children is encouraged since it is less complicated than the procedure used for adults. For this reason, adult patient procedures tend to be more difficult for the surgeons. The different preparation for
surgery on adult patients is due to the fact that the adults have more defined soft tissue deformities, wider clefts, and a skeletal structure that is not easily molded. It is simpler to operate on children, because the jaw has not grown as much and can be corrected easier (Murthy, 2009).

Overview of Cleft Lip and Palate Deformities

According to Lee et al. (2000), in the United States, one in every 1,000 newborn infants is affected by fetal cleft lip and palate. When the accurate prenatal ultrasound is used the future parents can get counseling about the genetic risk, possibility of fetal loss, anticipation for infant surgery, and overall prognosis. In some cases it has been difficult to detect the cleft palate in prenatal stages due to the acoustic shadowing from the surrounding structures. The three-dimensional ultrasonography can be beneficial to provide more visualization of these structures in a way that the two-dimensional ultrasonography cannot provide (Lee et al., 2000). Doctors and professionals can use 3D sonography to determine if an unborn baby has the cleft lip and/or palate as early as within the embryonic stage. The doctors look for a break in the alveolar ridge, where the teeth would be, to determine if there is a cleft palate or lip. Sometimes other abnormalities alert a doctor to the possibility of the unborn baby having the cleft palate or lip. When there is any disruption during the development of the head it can cause defects such as the cleft lip and palate (Yu, Serrano, Miguel, Ruest, and Svoboda, 2009). These deformities occur due to the failure of fusion of bones and matrix, which make up a fully formed palate and lip (Carinci, Scapoli, Palmieri, Zollino, and Pezzetti, 2007). I have attached an image in figure 1 to show what the three dimensional sonography images
would look like if there was a cleft deformity in the unborn baby (Lee et al., 2000).

The two main types of cleft lip and/or palate deformities are syndromic and nonsyndromic. The key characteristic separating nonsyndromic and syndromic cleft lip and/or palate deformities is the associated anomalies. If a person is defined as having a nonsyndromic cleft lip and/or palate this means that the person has the malformation, but the cleft patients lack any of the anomalies that can be considered associated with the deformity. When a patient has a cleft lip and/or palate and has one or more additional

Figure 1: These two images show what the three dimensional sonography images could look like if the unborn baby has a cleft lip or palate (Lee et al., 2000).
features then the deformity is considered syndromic malformation patients. The nonsyndromic malformations are the most common malformations that occur in live births. The cleft malformations are also characterized as cleft lip with or without the cleft palate or they can be characterized as the cleft palate isolated. These different categories help the surgeon to prepare and design a surgical procedure specifically to fit the patient’s needs (Carinci et al., 2007). One of the anomalies that can be in place to make a patient’s cleft a syndromic cleft is the Robin Sequence, previously known as the Pierre Robin Syndrome. The Robin Sequence is characterized by multiple deformities including retrognathic mandible or when the mandible is sunk back into the face more than normal, and glossoptosis with respiratory obstruction, which is the downward placement of the tongue causing the respiratory obstruction. One of the criteria for Robin Sequence is a U-shaped cleft of the palate. The cleft form can vary and in some cases the cleft may only involve the most posterior portion of the soft palate. The fact that the cleft varies shows that there is an uncertainty when diagnosing the Robin Sequence in patients correctly (Larson, Hellquist, and Jakobsson, 1998).

Hay-Wells/ankylolblepharon-ectodermal dysplasia-clefting syndrome can cause some complications, but the cleft lip and/or palate surgery can be performed safely on these patients whom have the anomaly. Hay-Wells syndrome is a rare autosomal dominant disorder which is diagnosed due to the presence of ankyloblepharon, ectodermal dysplasia, this is defects in tissues that arise from the ectoderm, in addition to the cleft lip and/or palate. The ectodermal tissue includes skin, hair, nails, and teeth. If the defect is in the skin around the nose or mouth, then those defects can cause issues for the surgeon. Also, if the teeth are have the deformity it can cause compromise the results of
the surgery. The Hay-Wells syndrome is one of the associated anomalies that can
sometimes be seen in cleft patients and this syndrome can cause complications with the
surgery (Cabiling, Yan, McDonald-McGinn, Zackai, and Kirschner, 2007).

Most cleft lip and palate patients do not have a stunt in the growth of their mouth,
but they have mal-positioned bones. According to Camporesi, Baccetti, Marinelli,
Defraia, and Franchi (2010), common findings that occur after the surgical procedure
include growth disturbances, especially mid-face retrusion which is when a part of the
maxillary bone or mandible are pushed farther back into the face than normal. Studies
have been conducted on un-operated adult cleft patients which have shown that a large
number of these patients possess the capability of normal growth of the maxilla without
any retrusion or protrusion which is when the maxilla is moved more forward than
normal (Camporesi et al., 2010). It has been seen that when the normal lip musculature is
absent this allows for protrusion in the maxilla in unilateral cleft lip patients and in the
pre-maxilla in bilateral cleft lip patients. In the bilateral cleft and lip patients the maxilla
is split in two places causing there to be a middle piece of the bone that stands alone. This
is known as the pre-maxilla. When the tongue rests in the cleft and stays there, this can
cause the rotation of the alveolus with teeth into incorrect positions. The anterior
maxillary teeth can cause movement of the mandibular teeth if the anterior maxillary
teeth are mal-positioned in any way. If this is a problem then the anterior maxillary teeth
they are typically permanent and made of compromised bone stock. Most of the time, it is
very difficult for an orthodontist to realign these teeth before having the corrective
surgery (Camporesi et al., 2010).
Bilateral cleft means that the cleft is incorporated on both sides of the midline and unilateral cleft means the cleft is only on one side or in one area. There has been a study that showed in both unilateral cleft lip and palate procedures (UCLP) and bilateral cleft lip and palate procedures (BCLP) that the most prevalent missing teeth were the lateral incisors (Camporesi et al., 2010). If the lateral incisors are not missing they are typically extracted because they are either too large or too small (Cassolato et al., 2009).

With these skeletal and dental changes there must be modifications in the approach and technique in repairing the cleft (Ciminello et al., 2009). It has been determined that the cleft lip and the cleft palate have different morphologies from one another. The morphology of the cleft lip and palate is different as well even though it takes more similar characters of the cleft lip than of the cleft palate (Heliovaara and Rautio, 2007). The morphologies of two different patients were studied: a normal control patient and a patient with the cleft lip and palate. After the surgical procedure was performed, the two morphologies were observed again. The patient with the repaired cleft and the non-cleft patient have the same morphology as long as the surgical procedure was done properly. The study of morphologies shows that the corrective procedure is actually working to get the cleft patient as close to a non-cleft patient as possible (Fudalej, Surowiec, Offert, Dudkiewicz, and Katsaros, 2010).

There has been some research done to narrow the cause of cleft lip and/or palate deformities, but no definitive answers have yet been recorded. The majority of the experiments that were performed point to the role that genetics play within these patients. In the past, there has also been some discussion of possible ways to reduce the chances of having a child with these facial deformities. However, there has not yet been any
information found that supports any of the assumptions that have been made. Scientists are still working on this area (Murthy, 2009).

**Procedures to Correct Cleft Lip and Palate Deformities**

Prior to the start of any of the corrective procedures most surgeons demand that the patient must weigh a minimum of 4-5 kilograms which is 8.8-11 pounds. If the patient does not weigh between 4 and 5 kilograms then presurgical preparation can be preformed, but the surgery cannot take place. If the surgeons have the option they would rather correct the cleft palate and lip when the patients are between the ages of 6-12 months (Gopalakrishna and Agrawal, 2010). The treatment and surgical methods are modified to suit each person’s needs according to age, problem, and the social condition. When looking for a solution to cleft lip and/or palate malformations, most patients are merely interested in a quick and simple solution that does not require frequent visits to the doctor or hospital and has the smallest financial burden. As the patient gets older the surgeon comes across more issues that need to be dealt with such as soft tissue deformity, wider clefts, and rigid skeletal structure. When dealing with these cleft lip and palate patients the main priority is the functionality followed by the physical appearance. Even though every patient’s procedure is different, all patients over one year of age have a primary surgery that consists of the palate repair and then later the lip repair. The logic behind having the palate repair and then the lip repair is not only allowing time for the healing process, but the un-repaired lip actually forces the patients to come back for the second surgery. During the few visits between the two procedures, the counseling and treatment begin for speech and dental deformities. Sometimes leaving the unrepaired lip does not work, because the results from the primary procedure are more than satisfactory
to the patient. This satisfaction from the primary procedure usually causes enough improvement that these patients do not follow up for the secondary corrections, even though they can attain counseling and the free services including the travel costs (Murthy, 2009).

The cleft lip and palate are put into two different categories and the procedures are modified for the different types. For one group of patients it is suggested that the soft palate be repaired at 3 months and the hard palate be repaired at 6 months (Broome, Herzog, Hohlfeld, de Buys Roessingh, and Jacques, 2010). There are surgical procedures for the UCLP and for the BCLP. There are images attached that show unilateral cleft lip and palate patients in Figure 2 and 3 and images of bilateral cleft lip and palate patients in Figure 4. These images also include pictures that were taken before the patients had the procedure done and after it was all completed (Murthy, 2009).

**The Unilateral Cleft Lip and Palate**

Burstein (2007) suggests that the deformity be observed as one deformity and not a bunch of separate ones. He suggests that there should be a team approach to dealing with the cleft patient. The team should consist of a craniofacial surgeon, orthodontist, dentist, prosthodontist, and speech and language pathologists, that can look at the patient as a whole (Burstein, 2007). The UCLP repair is done in two steps starting with the repair of the palate first and then six months later the lip can be repaired after the patient has healed from the previous procedure. The two flap technique with intravelar veloplasty, which is the reconstruction of the muscular sling in the mouth, is used to repair the full cleft palate and the incomplete cleft of the secondary palate or the structure that separates the nasal and oral cavity. To avoid a post-alveolar fistula or re-opening of the cleft, most
surgeons use the alveolar extended palatal flap, which is an instrument used for strength in the skin and musculature, to help prevent the fistula from occurring. The palatine shelves are the split in the cleft and when they are un-operated they can move to a vertical position instead of a horizontal position, which would make repair easier. When the shelves are oriented vertically it is very difficult to perform the paring incision, which is the incision made to correct the palatal shelves and create the full palate. The majority of surgeons suggest performing the cleft palate repair prior to the lip repair. This method provides better vision of the anterior palate and a better position for the nasal layer repair. Lifting the muco-periosteal flap from the lateral incision is how the paring incision is performed. The incisions allow for direct vision from the inside out. The problem with this procedure is that it risks the possibility of lifting the flap in the wrong plane. The flap lifting in the wrong plane, eventually, could cause profuse bleeding of the periosteum. For this reason, a nasal layer repair can be performed that can help prevent fistulae (Murthy, 2009).

Figure 2: The X-ray and photograph of a unilateral cleft lip and palate patient (Murthy, 2009).
Figure 3: The before and after pictures taken of a unilateral cleft palate and lip patient, this shows the results that came out of her surgical procedure (Murthy, 2009).

Figure 4: The before and after pictures taken of one of the bilateral cleft lip and palate patients and this shows the outcomes of the procedure that was described (Murthy, 2009).
Post-Operation Treatment

It is best to start an adult patient on a semi-solid diet with proper hygiene right after the procedure. Many patients cannot afford what is best for them, which is liquid diet like juices and milkshakes. The patients cannot afford the liquid diet because it takes a large amount of the liquid diet for a person to become full, especially an adult and majority of the time the liquid diet is unavailable. Patients who cannot afford or cannot obtain the liquid diet usually substitute soft, well-cooked foods immediately after surgery since the foods are more easily available and cheaper than the recommended liquid diet (Murthy, 2009). Through the questionnaire that was done by Gopalakrishna and Agrawal (2010), there was a strong agreement between the surgeons that were surveyed that the best feeding option was definitely spoon feeding over bottle feeding the cleft lip and palate patients. Some of the surgeons did suggest that specific droppers could be used. Both of the suggested feeding options are similar in the aspect that the cleft patients do not have to suck to get the food or drink. The reason that the bottle feeding is not good for cleft patient is because if the cleft is not totally closed then the patient has a hard time being able to suck without a full palate. If bottle feeding is used and the cleft patient has a recently corrected cleft, then using a bottle could compromise the repaired cleft. The use of a bottle could cause fistula or rupture the suture lines in the mouth. Gopalakrishna and Agrawal’s survey was a typical questionnaire with 28 easy to understand and precise questions. Most of the questions had a list of possible options and only a few of the questions were left open for discussion. In the questionnaire done by Gopalakrishna and Agrawal (2010) topics about the procedure itself and what the surgeons preferred when they performed the correction surgery on the cleft lip and palate patients. The majority of
the surgeons agree that lip adhesion is not used as a primary procedure, the nasal correction is performed at the same times as the lip repair. There were some surgeons who were willing to repair the palate and the lip at the same time in unilateral cleft lip and palate patients, but the surgeons would not repair both the palate and lip in the bilateral cleft lip and palate patients. The reason surgeons would not repair both the lip and palate within the same procedure in the bilateral cleft lip and palate patients is because there are more problems and a bigger risk for these patients (Gopalakrishna and Agrawal, 2010).

It is necessary for a patient to receive aggressive speech therapy, but the majority of the time the patients cannot receive it for financial reasons. All patients are required to be counseled for home speech therapy, due to the fact that there is a lack of availability of aggressive speech therapy. The surgeons wait to see when the patient is motivated enough to follow up for speech therapy. At this time the velopharyngeal incompetence correction is performed. The velopharyngeal is the portion of the mouth and throat that is responsible for swallowing and speaking. The incompetence is in the sphincter; this means that it does not completely separate the nasal and oral cavities during speech (Murthy, 2009).

Cleft Lip Repair

Approximately six months after the palate repair procedure, the surgeons will perform the cleft lip repair procedure. When there is a simple cleft lip then a straight line repair is used. When there is a wide cleft there usually is a more extensive procedure that needs to occur to fix the problem. It is usually a sub-periosteal dissection that has to go up the zygomatic bone, which allows the mobilization of the cheek muscles. The sub-
periosteal dissection means cutting under the membrane that surrounds the bone.

Sometimes a nose correction procedure is needed to complete the surgical process. This correction can be a minor procedure, such as a closed nose procedure. The closed nose procedure is when there is only a small incision made to correct the nose. Other times, a large incision is made on the cleft side allowing for the addition of more cartilage superiorly and medially. This procedure requires major suturing from one side to the other. If there is a major amount of nose correction then the corrections are not performed in the primary lip repair and it is put off until later when the patient receives the final rhinoplasty procedure. If the teeth are mal-positioned or rotated there is the risk of rupturing the mucosal suture line, which is the suture line from the nose through the lip. The mucosa suture rupture does heal, eventually. Rarely, it is necessary for a lining to be placed between the mucosal suture lines and the teeth that caused the rupture to repair it (Murthy, 2009).

The Bilateral Cleft Lip and Palate

The BCLP repair is a more difficult and intricate procedure. First, there has to be a palate repair, followed by the palate repair with pre-maxillary setback (Ferdous et al., 2010). Then to finish the procedure the lip can be repaired last, after the patient has healed from the other procedures. Even though surgeons and doctors recommend these procedures, some parents decide to take a different direction. According to Ferdous et al. (2010), depending on the situation, parents will have the lip repaired first and in most cases will not return for the remaining procedures. Parents will do this if they are having financial struggles, but want their child to experience a somewhat normal childhood. When parents make this decision for their child they do not always understand the
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consequences. A common complication of only repairing the cleft lip is fistula. Fistula is when the cleft lip opens again. If this occurs, the area becomes more susceptible to infection and growth that occurs in the un-operated palate can cause problems if the two pieces grow in different directions (Ferdous et al., 2010).

Problems can be added to the surgical procedure for cleft lip and palate patients, including the pre-maxilla twisting and protruding. The twisting and protruding pre-maxilla is especially problematic in older patients. Normally, the pre-maxilla is secured by the maxillary alveoli, the ridge where the teeth sit, and septo-maxillary ligament, the ligament that attaches the septum of the nose to the upper jaw. Sometimes in cleft patients the pre-maxilla is unrestrained by the maxillary alveoli and then is only attached to the nasal septum. In normal children, the septum is made up of cartilage. This cartilage has to slide forward because of the restraint on the pre-maxilla by the lip muscles and the ligaments, but this is quite different in the bilateral cleft patients. The pre-maxilla and the septum are required to move forward at the same rate due to the fact that they are held together. In this case, there is only one restraining connection, which is the vomer, a bone that is part of the nose. It is very typical for there to be disproportion within the size of the pre-maxilla and the space provided. In many of the older patients who have had the primary treatment, there exists a protruding maxilla that is often rotated. Due to the protrusion and the rotation of the pre-maxilla the proper bilateral cleft lip repair is incapable of happening without first correcting the protrusion and rotation. It is unlikely that the pre-maxilla of an adult patient will mold or realign after the lip is repaired, even though it is a possibility. The pre-maxilla typically needs to be corrected specifically, instead of relying on the correction of the lip to mold the pre-maxilla (Murthy, 2009).
When a patient has a pre-maxilla that protrudes more than 8-10 millimeters then the pre-maxillary setback has to be incorporated into the cleft palate repair procedure. When there is a greater than 8 millimeters protrusion the procedure becomes more difficult than normal and it can compromise the closure of the nasal layer. With the compromised closure of the nasal layer, it may be necessary for these patients to undergo more secondary procedures, which can include the repair of a fistula. To achieve the best results with the least number of surgical procedures, the pre-maxillary setback should be included in the primary procedure. After studying a few cases, it has been determined that the repositioning of the pre-maxilla can be done after a time of 6-8 years without causing problems with the mid-facial growth. After the 6-8 years worth of development, the pre-maxillary setback has only a very small negative influence (Murthy, 2009).

Cleft Palate Repair

According to Murthy (2009), the bilateral cleft palates are extremely wide, the shelves are vertically oriented and the vomer is usually unattached and just hanging in the middle of the cranial base. This procedure can be complicated by the protrusion of the pre-maxilla or a relatively short vomer that lays far away from the lateral shelves. To complete this procedure the two flap technique is used with the alveolar extension. The skin on the vomer with mucosa is cut on the midline causing the two flaps. The doctors try to make the vomer flaps useful for the nasal lining repair. When the pre-maxillary is protruding more than 10 millimeters or is extremely mal-positioned the surgeon creates a procedure for the cleft palate repair that encompasses the pre-maxillary setback (Murthy, 2009).
Cleft Palate Repair With the Pre-Maxillary Setback

The cleft repair with the pre-maxially setback is similar to the other procedures, but the pre-maxillary setback must be added. The mucoperiosteal flaps or skin on the palate is raised from both of the palatal shelves. Then, the palatal shelves have to be removed from the nasal mucosa and then the vomerine flaps are lifted during this procedure. The vomerine flaps being lifted allows for the bilateral vomerine flaps to be sutured to the nasal layer of the palatine shelves. Once the suturing is completed, the repairing of the nasal layer through the connection of the hard and soft palate can be finished. Then, a certain amount of bone has to be removed anterior to the vomero-premaxillary suture. The vomero-premaxillary suture holds the vomer bone and the maxilla together. The nasal septum can then be moved and re-aligned with the lateral maxillary segments. Then the pre-maxilla is moved to its new position and it is fixed by using the Kirschner “K” wire, which is sterilized, sharpened, smooth, stainless steel pins. Some surgeons like to gain additional stability to be able to guarantee their work. To gain the stability there is a procedure that can be done where the alveolar defect is minimal. There are some surgeons who would bone graft the cleft alveolus for stability, but most surgeons would like to avoid the simultaneous bone grafting of the cleft alveolus, because no one can ever consistently gain the watertight seal that is necessary (Murthy, 2009).

Bilateral Cleft Lip Repair

In adult patients, depending specifically on the gender, the philtral column has to be narrowed to as small as 8-10 millimeters. The philtral columns are the vertical ridges above the lip that connect to the underside of the nose. Those one millimeter strips are de-epithelialised to be able to help augment the blood supply. There is a bilateral, wide,
subperiosteal dissection that goes up to the zygoma. This step is essential to bring the musculature over the pre-maxilla. The open tip nose correction can be done, which is a nose correction that is invasive and the nose is fully exposed. The blood supply to the philtral column known as the anterior septal artery is divided. The open technique for nose correction is rarely used. A four to five millimeter narrow strip needs to be left on the free edge of the vomer and the pre-maxilla when repairing the anterior palatine. The nasal floor width, which makes up the roof of the mouth, needs to be decreased and muscle repair can be finished when the nasal floor repair is completed. After all the previous repairs are finished, the central tubercle, which is the middle dimple of the upper lip, can be reconstructed by vermillion which is the substance used to fill out lips in lip augmentations with the white line from the lateral segment. To avoid a defect of the vermillion, it is important for the muscle to be separated from vermillion and the suturing muscle. The nose is stitched to be able to repair the alar cartilage into the new position. The new position of the nose also allows for the decrease in the dead space that was created by the closed dissection of cartilages. In some cases it is necessary to use primary Abbe flap, which is full thickness composite flap, because of the shortage of tissue available in the prolabium. Images of this can be seen in Figure 5 (Murthy, 2009).

According to Duskova, Kotova, Sedlackova, Leamerova, and Horak (2007), studies have shown there may be an alternative to the prosthetic treatments that are used now. The alternate procedure involves taking a bone graft of the maxillary alveolus cleft and then inserting a dental implant. There are possible complications that include graft re-absorption, fistula and scarring of the soft tissue. The risk is higher in women due to a more slender skeleton and female metabolism (Duskova et al., 2007). This idea of bone
grafting was also suggested by Carlini, Biron, Gomes, and Da Silva (2009). They thought that the procedure was complex and did have great risks, but also thought that it had the best outcome for the patient (Carlini et al., 2009). The risks can be avoided according to Chigurupati (2005), by using the distraction osteogenesis, which is a surgical procedure that is used to reconstruct skeletal deformities, can be a useful technique in managing craniofacial deformities, but it can never replace conventional orthognathic, face and jaw surgery. The benefit of the orthognathic surgery is that it is safe and predictable (Chigurupati, 2005).

*Figure 5:* This is an example of the Abbe flap that was described previously and they are before and after pictures of a patient that had the bilateral cleft procedure (Murthy, 2009).

**Follow up Procedures and Outcomes**

Morphological classification is one of the methods that can be used to understand the preoperative dental casts, photographs, and clinical records. Some surgeons will then fill out a classification template for the patient; this makes the results of the surgery clear
for other surgeons who look at the file. The file can be used if the patient switches surgeons or if the cleft patient wants to get a second opinion. The classification template puts all the information into one chart and shows the patient before and after their corrective procedure and it also allows for other surgeons to see the results as well. The dental casts show how wide the cleft was before the corrective surgery and then how much the cleft closed due to the surgery. The dental cast can be seen in Figure 6 that is listed below (Larson et al., 1998).

Figure 6: This is an example of the before and after dental casts of one of the patients after the primary surgical procedure was completed (Larson et al., 1998).

Cleft lip and palate patients do have to attend follow up appointments so their recovery and progress can be monitored until everything is healed and no risks are
apparent. Patients typically continue these follow up appointments until the doctor thinks the patient will not experience any more complications. Sometimes there are follow up procedures that are necessary to fix problems that were not completely corrected in the first round of procedures. The “hole-in-one” procedure is done when patients have no choice but to have as few procedures and doctor visits as possible due to money issues or travel issues (Murthy, 2009). There is a problem with this procedure in that it only gives the patient one layer of closure in the alveolar region. Only having the one layer of closure may result in fistula, which is the breaking open of the layer of skin. The fistula can be fixed using a prosthesis or by doing another surgery and trying to add more layers of skin for stability and strength. Patients can have surgery to add more layers when they heal from previous procedures to ensure that fistula does not occur. According to Ciminello et al. (2009), even though the addition of layers procedure is an option, most doctors do not recommend or will not perform the addition of layers procedure if it is not 100 percent necessary. Another risk is velopharyngeal incompetence which occurs in many adult patients for many different reasons. Due to the velopharyngeal incompetence, the primary pharyngeal flap has been suggested to patients because it helps to correct the air flow during speech. Typically, the primary pharyngeal flap is discouraged because of the risk of decreasing the speech results. There is a complex structure that can be used, which is the velopharyngeal port this regulate air between the oral and nasal cavities. The problem with the velopharyngeal port is that it is difficult to determine the structural deficiencies that may occur if the palate is not repaired first. Studies have shown that when a number of un-operated cleft patients were randomly selected for primary palate
repair and primary pharyngeal flap with cleft palate repair there was no difference in the speech outcome in all of the patients (Ciminello et al., 2009).

**Results and Speech Outcome**

It takes time for the scarring from the procedures to become less noticeable. It also takes time to heal fully from the procedures. Normally the results of the surgeries are positive and successfully fix the problems that the cleft lip and palate had previously caused in the patient. According to Murthy (2009), it has been shown that patients who were operated on later in life are less likely to attend follow-up rehabilitation sessions regularly after their primary procedure. These patients have already been accepted for their appearance and their defective speech and there is no motivation for the patient to attend the follow-up sessions. Patients are normally happy with the outcome of their lip repair, especially the patients who have the complete unilateral cleft lip repair and primary nose correction. Sometimes the nose correction is so severe that a separate procedure needs to occur at a later time. Some of the patients will require full rhinoplasty and dental work after all procedures are complete with the cleft palate and lip (Murthy, 2009).

The age of the patient is a determinant in the speech outcome. Adult patients seem to have more trouble adapting because they learned how to speak with the cleft and now that it is gone, speaking must be relearned by the patient. When a person learns to talk with a cleft the person has to use different techniques to make the words sound clear. If the patients are younger it will be easier for them to learn to speak since they do not have an idea of how to speak already and it is like learning something brand new. Learning something brand new might be difficult, but not as difficult as having to relearn to speak
when the skill is already known in another way. Even through these difficulties, most patients can gain full speech after healing from the procedures, it just may take more time for some patients. According to Lohmander-Agerskov (1998), studies have shown that an improvement in intelligibility post-operation is very likely. The scientists attributed this to the improvement in the articulation and resonance, after the operations and all the deformities and associated problems are repaired. The majority of patients showed an improvement in speech even though very few of the cleft lip and palate patients actually retrieve the normal speech level as compared to other people (Lohmander-Agerskov, 1998).

**Potential Problems for Cleft Lip and/or Palate Patients**

People with an un-operated cleft lip and/or palate are prone to many psychosocial and psychological problems that can alter that person for the rest of the patient’s life. These problems are obvious in most patients (Campbell and Costello, 2010). Speech problems and facial deformities cause the majority of patients to be in one of two situations: either they never start school or they drop out (Murthy, 2009). Murthy (2009) also said that the patients are not only rejected by peers, but most of the time they are rejected by the teachers also. For people with cleft palate and/or lip deformities, teasing becomes a normal part of their lives. This constant teasing can cause them to be unhappy with their facial appearance and their ability to communicate. These problems cause the patients to become socially separated, and most of the time they only communicate with family. Psychologists working with the patients stated that these patients have a higher rate of behavioral problems along with depression and low self esteem (Lohmander-Agerskov, 1998).
Most surgeons would recommend the correction procedure for cleft lip and palate malformations because the potential outcome of the procedure outweighs the problems that occur in people who do not have the procedure. According to Murthy (2009), a child can live a typical life if the procedure is completed at an early stage in their childhood. Even though people can function throughout their lives without having the procedure it is easier for them to have the surgery and not have to adapt to life because of the deformity. Bullying and teasing can alter a child for life; by changing the personal ideas that they feel and make them feel down because of what other people think and say about them (Murthy, 2009). Repair procedures for patients with cleft lip and palate are positive and are usually encouraged. Not only does the corrective surgery fix the deformity, but the surgery also improves the patient quality of life (Murthy, 2009).

**Conclusion**

The cleft lip and palate is a common deformity seen in third world countries, but it does have its exposure in the United States and other developed countries. The reason that it is not as prevalent in the developed countries is because there is more knowledge, more advanced medical services and people have more financial cushion to have the deformity corrected early (Murthy, 2009). According to Lee et al. (2000), the cleft lip and palate can be detected in the prenatal stages with the use of the three-dimensional sonography. The cleft patients can have associated anomalies which include Robins Sequence Syndrome or Hay-Wells Syndrome. Carinci et al. (2007) mentioned that having an associated anomaly can make correcting the cleft a more difficult process than it would have been without any anomalies at all. Many different surgeons have suggested different ways to repair the cleft lip and/or palates in the patients. It seems as if they all
have had good experiences with their procedures and they have key reasons as to why they prefer their procedures over any other procedures then those procedures all work it is just a preference. It seems like the majority of surgeons tend to deal with the unilateral cleft and the bilateral cleft in two different ways. The unilateral is taken care of in a one stage procedure and the bilateral is taken care of by a two stage or more procedure. The bilateral cleft is the more intricate deformity and requires more attention and modification than the unilateral cleft does. With every surgical procedure there are risks that have to be taken into consideration, but the likelihood of the risks actually happening are very slim. The outcome of the procedure is typically positive, the physical appearance of the patient is satisfactory and the only indication that there was a deformity is the scar. The scar will fade with time. The studies have shown that the majority of patients gain full speech after the corrective procedure is completed. For some patients to gain full speech aggressive speech therapy is required and hard work from the patient. Altogether, many surgeons are capable of correcting the cleft lip and palate and have the resources to help rebuild the speech and functionality of the patient. In conclusion, having the corrective surgery and making it a priority to attend the follow up appointments is worth every risk associated with the surgery. Patients who have the cleft corrected, especially early, increase the quality of life and are able to live a normal life afterward (Murthy, 2009).
References


