

Management of Cleft Lip and Palate: *a Primer for Parents and Family*

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I. INTRODUCTION

The diagnosis of a cleft of the lip and/or palate can be traumatic to parents regardless of whether the cleft is identified at the time of birth or by means of a prenatal ultrasound. Parents, grandparents and other family members want to know all about the situation, the future roles of surgery, orthodontics, speech therapy, etc., and want to know these answers *right now*. The parents are beginning a trip on a long learning curve during which they will come to know more than they ever wanted to know about clefting and its therapy. This booklet is intended to be a brief guide to this trip and contains the viewpoints of one surgeon on the entire process.

II. THE BASICS

A cleft is a natural accident that occurs during fetal development in which the baby's tissues fail to fuse or flow together. Clefts don't hurt the baby and, from the standpoint of a newborn, having a cleft is the most natural thing in the world. Clefts of the lip develop around the 8th week of fetal development - at about the time mom learned she was pregnant. Clefts of the palate develop around the 12th week of pregnancy. The cleft can involve a part or all of the lip and palate structures. It is convenient to break down the structures that might be involved in a cleft into four parts: 1) the lip, 2) the alveolus, 3) the hard palate and 4) the soft palate. Any or all of these structures can be involved in the cleft although it is most common for the cleft to involve *all* four areas. The smallest form of a cleft (a "microform") is a notch in the lip, the alveolar ridge of the upper jaw, or of the soft palate. (See below)



When this affects the soft palate, the uvula (that thing that hangs down in the back of your throat) is “bifid” or double. More about that later. I’ve already gotten into some medical jargon, so here’s a quick primer on the terminology that you need to know. Other terms will be introduced in their specific sections.

alveolar ridge (alveolus) : the ridge in the upper jaw where the gums are and from which the teeth will erupt.

hard palate: the bony part of the roof of the mouth

soft palate: the soft, muscular part of the roof of the mouth

primary palate: a fairly useless doctor term that refers to the front part of the hard palate

secondary palate: another fairly useless doctor term that refers to the back part of the hard palate and all of the soft palate

velopharyngeal incompetence (VPI): the speech problem that some cleft children have whereby the words seem to come out of the nose during speech

maxilla: the upper jaw

mandible: the lower jaw

unilateral: referring to one side

bilateral: referring to both sides

uvula: the thing that hangs down in the back of your throat

prolabium: in bilateral clefts, the central part of the upper lip and upper alveolus that is initially attached only to the tip of the nose

columella: the soft tissue strut or column of the base of the nose that separates the nostrils

fistula: an opening connecting two areas. Clefts involve either palatal fistulae, or holes in the palate between the mouth and the nose and nasolabial fistulae, holes under the upper lip connecting this area to the nose.

congenital: this term simply means “present at birth”, and has nothing to do with the genitals, or sex organs. Cleft lip and palate are *congenital* malformations.

pharyngeal flap: An operation that is needed to correct VPI that cannot be adequately managed by speech therapy.

III. GENETICS

The development of any form of a cleft of the lip and/or palate is NOT specifically a genetic thing, although parents with one cleft child are at a slightly increased risk (2 - 4%) of having another cleft child. If there is already one family member with a cleft, the risk rises to 10 - 12%. When your cleft child grows up, he or she has a 2 - 5% chance of having a child with a cleft and that risk also rises to 10 - 12% if another family member already has a cleft. The incidence of cleft of the lip and/or palate is 1 in every 700 to 1000 births in the US and is somewhat more frequent among Asians. In other words, just because you have one baby with a cleft, the chances are still very small that you would have another. I have one pair of identical twins in my practice, one child with a unilateral

cleft lip and palate and the other without a cleft. Otherwise, the two boys are identical. Clefting is what we refer to as a *multifactorial* process and there is more than genetics at work here.

IV. THE CLEFT LIP/PALATE CRANIOFACIAL TEAM

The reason that children with clefts or other craniofacial problems are seen by a team of professionals is that the interaction of the team members has a bearing upon the specific recommendations each might make as to treatment and timing. The members of cleft teams vary from institution to institution, but most contain at least one of each of the following: speech pathologist, pediatrician, surgeon (either maxillofacial, otolaryngology or plastic), orthodontist, pediatric dentist, otologist (ear specialist) and more. The recommendations of the cleft team are just that - recommendations for the planning and timing of treatment.

V. FEEDING

The *most important* aspect of the early care of a baby with a cleft is that of feeding. A cleft of the palate interferes with the baby's ability to create suction in the mouth. The delivery of milk, either from the breast or a bottle, into the throat for swallowing is seriously impaired. Breast feeding can be quite frustrating as the child tries to latch on, only to fail to suckle. Unfortunately, direct breast feeding is usually not possible with a cleft of the palate, but can sometimes be accomplished if the cleft only involves the lip. The basic idea in cleft feeding is to introduce the milk into the mouth in a way that does not depend on the creation of suction to move the milk from the carrier back into the throat. The Mead Johnson and the Haberman feeders allow the milk to run out of the nipple end, the Mead Johnson even allows the parent to apply some positive pressure to force the milk into the mouth. Breast feeding is therefore most definitely possible with a cleft palate, but requires the intermediary use of a breast pump and transfer of the mother's milk to a feeder prior to offering it to the baby. Clefting of the palate is what is responsible for difficulty with feeding and children with an isolated cleft of the lip only or the lip and alveolus generally have minimal problems with feeding.

VI. EAR PROBLEMS

words:

eustachian tube: The normal tiny little tube that connects the normally air-filled middle ear space with the throat, allowing the equalization of pressure between the middle ear and the throat.

In days gone by, it was common for children with cleft palate to develop recurrent ear infections and have a significant hearing loss by adulthood. The reason for this lies in the *eustachian tube*. When you go up the elevator in a tall building and your ears “pop”, that’s air venting from your middle ear into the throat - equalizing the pressure - through the eustachian tube. This tube is briefly opened upon swallowing or yawning due to contraction of the muscle that connects across the soft palate to its counterpart on the opposite side. This is the same muscle that does *not* cross over to the other side in a cleft palate. The lack of function of this muscle, along with some other related problems with the eustachian tube, means that the cleft child has difficulty equalizing the pressure in his middle ears. When a negative pressure situation persists in the middle ear, fluid seeps out of the walls of the middle ear space and doesn’t go away. Although painless, the presence of this fluid does two bad things. Number one, the fluid decreases the natural movement of those tiny little bones of hearing in the middle ear, the ones that transmit the vibration of sound from the ear drum to the inner ear. This produces a significant *hearing loss* and greatly interferes with the child’s learning of proper speech. Number two, the fluid is an excellent place for germs to grow and recurring ear infections can develop. For these reasons, we generally recommend that children with a cleft of the palate have ear tube placed. These tubes (called P.E. tubes (pressure equalization)) are placed through the eardrum and painlessly allow pressure equalization to the outside. They don’t actually allow the fluid to drain out, but by equalizing the pressure, they keep it from forming in the first place. If an ear infection should happen, the pus simply drains through the tube without causing pain to the child. The eardrum starts to get rid of the P.E. tubes almost as soon as they are placed and they generally stay in for 6-18 months unless special long-term tubes are used.

VII. THE CLEFT LIP

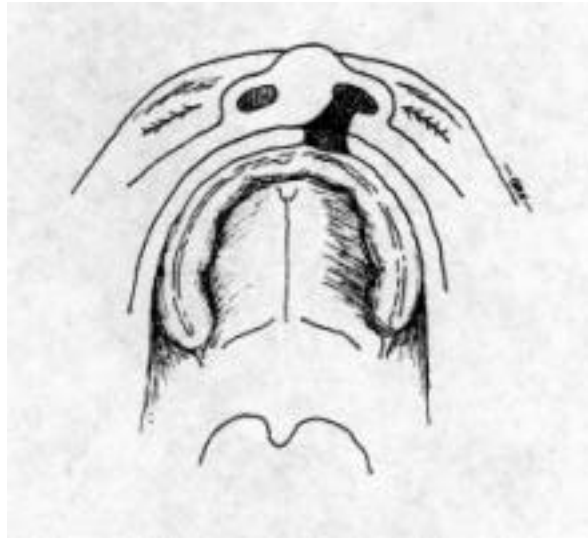
words:

philtrum: the midline furrow of the upper lip that Tom Brokaw doesn’t have

Millard repair: rotation-advancement design repair of unilateral cleft lip that I prefer.

Simonart’s band: band of skin that crosses the cleft of the lip

The cleft of the lip creates an opening of the ring of the circular muscle (orbicularis oris) that wraps around the mouth inside the lips. Without the function of this circular muscle, the base of the nose spreads out to the side, making the base of the nose appear wide and distorted. (See below – isolated cleft lip)



Some cleft children have varying degrees of an *incomplete cleft*, i.e., part of the lip skin (without muscle underneath) may bridge across the cleft partially supporting the base of the nose.

This skin bridge across the cleft is referred to as a *Simonart's band*. Its presence makes the lip repair somewhat easier because the circular muscle has been partially bridged. In some complete clefts that are wide, a Simonart's band can be created by a procedure called a *lip adhesion*. This is an operation that simply adheres the two sides of the cleft lip together and is done when the baby is several weeks old, two to three months before the final lip repair operation is done. By restoring the orbicularis oris muscle, the lip adhesion takes much of the tension off the final lip repair closure and can help in producing the best result. Dental appliances such as the Latham appliance are usually not done for unilateral clefts of the lip. More about the Latham appliance later.

Many surgeons have designed their own type of lip repair operation and there are advantages and disadvantages to each type. In ancient times, the lip was simply stitched together with horsehair thread. The operation most commonly done today for unilateral cleft lip and the one I favor is called the *Millard repair*. This involves unrolling the side of the cleft under the nose, next to the midline and scooting over the part under the nostril edge. This produces a fine curving scar line that comes about as close as possible to positioning the scar near the normal ridge on either side of the lip midline. This operation also involves work on the shape of the nose that is done from the inside of the cleft. The timing of the lip repair is not critical, although I generally prefer to wait until about 10 weeks of age. If a lip adhesion is needed, the adhesion is done first, usually before 10 weeks, and the final lip repair is done at about 6 months of age. Lip repair is done under general anesthesia and your baby can usually go home that afternoon unless there is a reason for overnight admission. P.E. tubes may be placed by the otologist at the time of lip repair and add little to the operating time. Soon after surgery, it is not uncommon for

the lip to draw upward slightly as the healing process temporarily tightens the healing tissues before relaxing later.

VIII. THE CLEFT PALATE

words:

Furlow palatoplasty: a complex palate repair that produces the best palate length and speech and is the technique I prefer for all palate repairs. The resulting scar zig-zags across the soft palate, and beneath it, the muscles of the soft palate are properly realigned.

Two-flap palatoplasty: the type of palate repair that I used to do and that is still very popular. This produces a straight line scar down the middle of the palate.

Intra-velar veloplasty: Say that 20 times. This is usually included in a two-flap palatoplasty and refers to the attempt made to realign the muscles. It doesn't work as well as the Furlow technique.

Submucous cleft palate: A cleft of the palate that involves only the muscle layer and appears, superficially, to be a normal palate. The tip-off is that the uvula is *bifid*, or double. A submucous cleft palate usually requires a Furlow palatoplasty.

The only reason to close a cleft of the palate is for proper speech. Children learn to eat quite well with an open cleft of the palate and the passage of food, milk., etc into the nose causes no problems. Some controversy exists over the best time to close the palate and the controversy can best be summed up by the fact that there is a wide range of acceptable times to close the palate. We would like to have the palate closed and functioning prior to the development of meaningful speech, at least by 18 months of age. I generally try to get the palate closed somewhere between 6 and 12 months of age, before your baby begins to acquire speech. You might wonder why we wait, why don't we just do it all when we do the lip. Some have advocated just that, but I and many others feel that the best results are obtained when the child is a bit older and the mouth and oral structures are simply larger. Another important advantage of waiting is that the older child is better able to withstand a week or so of a sore throat that interferes with eating and swallowing to the point that some weight loss occurs. The palate closure operation, or palatoplasty, is a rather delicate procedure and, like the lip closure, I do it with surgical *loupes*, or small microscopes fastened to my surgical glasses. The muscles of the soft palate course forward into the hard palate cleft and must be redirected into the midline. The goal of the operation is to make the soft palate work to keep the word sounds from going out the nose. I prefer an operation termed the "*Furlow double reversing Z-plasty*" palatoplasty which is a mouthful but produces the absolute best speech although it takes longer than conventional palatoplasties. The Furlow operation is quoted as 90% or more successful in producing good speech, although some speech therapy is almost always needed. The anatomy of every cleft child is different as to how much tissue is present, its

location, etc. and not every child is a candidate for the Furlow procedure, but almost all are.

There are a few complications of palatoplasty and the Furlow procedure by-passes most of them. Occasionally, a small leak will develop between the mouth and the nose called a *fistula*. Fistulas usually cause no problem with speech but can result in minor leakage of liquids back in to the nose during swallowing. They can be closed as a simple procedure at any time.

IX. BILATERAL CLEFTS

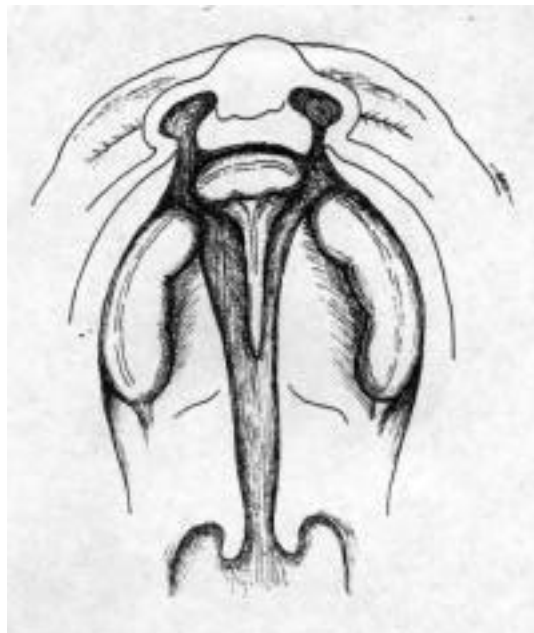
words:

Latham appliance: dental appliance that helps align the segments of the upper jaw prior to lip closure

Lip adhesion: a preliminary operation that creates an adhesion between the parts of the upper lip - across the cleft sites - to align the central lip and jaw segment.

Prolabium: the central part of the upper lip and the alveolus of the upper jaw that is not connected to the sides because of bilateral clefts. At birth, the prolabium is therefore attached only to the tip of the nose and tends to stick out.

Bilateral clefts involve both sides and can involve any or all of the four parts of the cleft. Bilateral clefts can be asymmetric, that is, they can involve differing combinations of the four components of a cleft on each side. Like the unilateral cleft, bilateral clefts most commonly are complete involving all four components on both sides. (See below)



The child with a bilateral cleft is born with a somewhat-less-than-adorable appearance of the upper lip and nose because the central part of the upper lip and the upper alveolus are attached to the tip of the nose and not to the mouth. Control of the prolabium is an important concern in the early management of a bilateral cleft as the prolabium must be brought back into alignment with the rest of the lip and alveolus before proper repair can be done. There are several ways to go about this. One commonly employed method is the use of lip adhesions on both sides. Like the unilateral cleft, this harnesses the *orbicularis oris muscle* (the circular muscle that goes around the mouth to make us pucker) to naturally realign the prolabium. Another potential benefit is the fact that the prolabium probably has a borderline blood supply out there on the tip of the nose and the attachment of good tissues to either side improves its blood supply and thereby improves the tissues' health and growth potential. Prior to the lip adhesion procedure, the parents may be instructed to tape the prolabium and cheeks together to decrease tension. When lip adhesions are performed, the final and definitive lip repair operation is delayed until about 6 months of age.

The other route with a bilateral cleft is the use of the Latham appliance. Dr. Latham is a Canadian orthodontist who designed a trap-like dental appliance that is retained in the baby's upper jaw by tiny pins that are driven into the bone. It sounds brutal, but it is painless once in place. Part of the device then engages the prolabium and a series of orthodontic elastic bands or a tiny screw device is used to pull the prolabium back into alignment. Once the segments are aligned, either lip adhesion or the definitive lip repair can be done. Fans of the Latham device claim that it allows closure of the alveolus at the time of lip repair, avoiding the need for later bone grafting. This is rarely the case. The Latham device requires that dental impressions be taken, which usually requires general anesthesia. The device is placed under a second general anesthetic and the lip adhesion or repair is done under a third general anesthetic. The advantages are that the prolabium can be very accurately positioned with the device. The disadvantages are that an extra general anesthetic procedure is necessary and the pins have been reported to cause permanent injury to the developing permanent teeth. There is some controversy regarding the possibility of interference with the growth of the maxilla (upper jaw) following the use of the Latham appliance and its benefits must be carefully weighed against its risks. The Latham device is useful, but should only be utilized by individuals with a dental background.

X. SPEECH THERAPY

words:

VPI (velopharyngeal incompetence): VPI is the leakage of air past the soft palate during speech. This can be thought of as a situation whereby the words seem to leak out of the nose rather than coming through the mouth, and means that the soft palate is not doing its job to direct the air flow (and words) through the proper mixture of oral and nasal sounds.

Nasopharyngoscopy (“nasendoscopy”): A procedure done with a fiberoptic endoscope that allows the operator to view the movement of the throat through fiberoptic cables that can be passed easily through the nose. This procedure is done on children who are old enough to understand and cooperate with the examiner, usually age 4 and older.

Speech therapy is required to a variable degree by all children who have a cleft of the palate. Children begin the regular acquisition of speech by 18 months of age and I advocate palatal closure by about one year of age to make sure that the mechanism for speech is in place and working by that time. About three months after palatoplasty, a formal speech evaluation is recommended to see if the surgery was successful in preventing *velopharyngeal incompetence* (VPI). Depending on the success of the palatal surgery and the size and degree of leakage of any palatal or nasolabial fistulae, speech therapy is needed. Some cleft children, despite proper surgery to close the palate and despite speech therapy, develop VPI. VPI can be managed in several ways. The first way to manage VPI is through speech therapy. Mild cases of VPI can be controlled by training the child to concentrate on certain sounds and to employ a number of compensatory mechanisms to minimize or eliminate the air leakage through the nose. If speech therapy fails, two options are possible, depending upon the result of nasopharyngoscopy (“nasendoscopy”). This procedure is done with a topical anesthetic in the nose and allows actual visualization of the palate movement as well as the movement of the side walls of the throat and the movement of the back wall of the throat forward (*Passavant’s ridge*). All of these movements normally produce a closing off of the nose from the throat during some speech sounds, but one or occasionally all of these components may not be working properly. The proper identification of what parts of this speech mechanism are and are not working properly is important in establishing a diagnosis of the child’s speech problem.

Prosthetics: A dental prosthesis can be constructed to clip on to the teeth and to support a “speech bulb” that extends into the throat to fill the gap in the closure of the soft palate to the back wall of the throat. The advantages of such a prosthesis are that no surgery is involved and the device can be removed at night to widely open the airway space for breathing, which limits snoring, etc. The disadvantages include the need to wear a dental appliance every day and to have it periodically adjusted and occasionally reconstructed to compensate for normal wear. One rationale for the use of this device is, in the words of Robert Blakeley, Ph.D., to “tease” the maximum movement out of an impaired palate to get the best effort possible from the existing muscles and palate anatomy.

Surgery: Two surgical procedures can be considered for the management of VPI. Each can produce a permanent correction of the problem, depending on the findings of nasopharyngoscopy (nasendoscopy):

pharyngeal flap: this is the classic “speech operation” that many cleft children had to undergo in years gone by. The surgery involves taking a vertical strip of the middle of the posterior wall of the throat and elevating it up and attaching it to the back edge of the soft

palate. This permanently closes off the midline of the throat, and forces air to pass from the throat to the nose through “portals” on either side of the pharyngeal flap. This operation works very well for children who demonstrate good motion of the side walls of the throat during speech as seen on nasopharyngoscopy. This lateral wall motion is important because it means that the movement of the side walls can temporarily close the portals during speech to properly divert the words and air stream through the mouth, yet still allow normal breathing through the nose.

sphincter pharyngoplasty: This operation is done in situations where the lateral wall movement is not adequate to ensure that the portals will close during normal speech. The sphincter operation redirects throat muscles into a horizontal orientation such that their contraction produces a temporary closing off of the throat during speech. In theory, this works well for those children who, probably genetically, do not have good lateral wall movement as a part of their speech mechanism. Some have described the operation as “dynamic”, implying that these throat muscles retain their ability to contract. This is probably not true, but the redirection of these muscles produces helpful scarring that can assist in throat closure during speech.

XI. NASAL SURGERY DURING CHILDHOOD

words:

columella: The midline strut of skin and underlying cartilage that connects the tip of the nose to the upper lip

tip: the tip of the nose is often misshapen and somewhat wide in cleft children

dorsum: the part of the nose that connects the forehead to the tip. This is where some people have a hump

rhinoplasty: the “nose job” operation that involves reconstruction of both the bone and cartilage parts of the nose

septum: the midline wall that separates the right nostril from the left. All children with a unilateral cleft and many with a bilateral cleft have a *deviated septum*.

There is an old saying regarding cleft surgery that the lip repair is easy, the nose repair hard. The shape of the nose is begun at the time of lip repair at 10 weeks of age and continues into adulthood. Commonly, age five is a good time for nasal touch-up surgery for a child with a unilateral cleft. Children with a bilateral cleft have a characteristically short columella with the appearance that the tip of the nose is stuck down to the upper lip. Age 5 is also a good time for a columella-lengthening procedure for bilateral cleft children. In either unilateral or bilateral clefts, another nasal surgery may be necessary at around 11 or 12 years, following bone grafting the alveolar ridge (more about that later). The final rhinoplasty is deferred until growth is at or near completion (around age 16 -17 in girls and 18-19 in boys) and any orthognathic surgery on the upper jaw has been completed.

XII. ORTHODONTICS

words:

crossbite: a characteristic of a malocclusion whereby the upper teeth lie inside the arch of the lower teeth.. Normally, the upper teeth should extend out over the lower teeth by about $\frac{1}{2}$ a tooth width.

orthognathic surgery: jaw surgery to correct jaw position and straighten the profile. The *Le Fort I osteotomy* is the most common orthognathic operation for teenagers with clefts.

supernumerary teeth: extra teeth that characteristically form around a cleft

cleftal teeth: a shorthand term that describes supernumerary teeth that erupt into the cleft

Braces will be necessary and indeed will be a very important part of the overall management of any cleft that involves the alveolus. Children with an isolated cleft of the lip or an isolated cleft palate might need orthodontics just as many non-cleft children require braces for bite problems totally unrelated to clefting. Orthodontic treatment for cleft children usually involves two “phases” and the first phase begins around age seven. The first phase is intended to round out the upper dental arch and to increase the width of the upper jaw. Clefting, or perhaps the surgery done to close the palate, causes a transverse constriction of the upper jaw that produces a crossbite. Phase I of treatment expands the upper arch and also aligns the upper teeth on either side of the cleft to prepare it for a bone graft to put good bone into the cleft in the alveolus. The bone graft can be thought of as the keystone being placed into an arch, but more about bone grafting in the next section. After the cleft alveolus is grafted, at anywhere from 8 to 10 years of age, the orthodontist waits until the remainder of the permanent teeth erupt before beginning the second phase, around 13 or so. The second phase of treatment completes the correction of the malocclusion and also may have to deal with the very common problem of missing teeth. Dental abnormalities are common in the immediate vicinity of the alveolar cleft. *Supernumerary teeth* (extra teeth) are often found around the cleft and commonly erupt into the cleft (*cleftal teeth*). Sometimes the lateral incisor (the smaller tooth just to the side of the front teeth) is missing in the permanent dentition and may require replacement. This can be done by a dental implant or by orthodontically scooting the canine and the rest of the teeth on that side over to take its place. My daughter had a congenitally missing lateral incisor, although she did not have a cleft, and her canine was scooted over and with a little fine dental reshaping, that tooth looked just like a lateral. About 25% of children with a unilateral cleft lip and palate will require *orthognathic surgery* to advance the upper jaw to align the teeth. The reason for this is that upper jaw growth in some cleft children does not keep up with lower jaw growth. In these children, phase II orthodontics may include an operation on the upper jaw which typically moves the upper jaw both forward and down. This is called a Le Fort I osteotomy and usually includes another bone graft for stability. . More about that later. Bilateral clefts have more difficult orthodontic problems because of that pesky *premaxilla* that seems to have a mind of its own. Once it is in reasonable alignment with the remainder of the upper jaw, the baby teeth start erupting and we have teeth going everywhere. The orthodontist can't

put braces on the baby teeth and move them around because the roots of baby teeth are designed to dissolve as the permanent teeth develop. Orthodontic forces would just make them dissolve faster, so we have to wait until the permanent front teeth erupt (around age 7) before orthodontics can help align the premaxilla. Another problem with bilateral clefts is that the transverse constriction of the upper jaw can be more pronounced than in unilateral clefts. This makes correction of crossbites more challenging and orthognathic surgery is more frequently necessary in bilateral cleft teenagers.

XIII. ALVEOLAR CLEFT GRAFTING

The purpose of putting bone into the alveolar cleft is purely to pave the way for the permanent canine tooth (“eye tooth”) to erupt. The canine has the longest root of any tooth and is a very important part of the dental arch. Years ago, the importance of bone grafting the alveolus was not appreciated and many canines erupted into the cleft itself where the tooth had poor bone support, and was ultimately lost. Now, bone grafting is routinely done near the end of phase I of orthodontics, and is optimally timed when X-rays show the canine root to be about half-formed. The operation also closes the nasolabial fistula and puts solid bone in the floor of the nose on the side of the cleft. The canine tooth then erupts through this healthy bone to assume its position in the dental arch. Several sources have been advocated for harvesting of the bone graft, but I prefer the time-tested graft obtained from the hip. Just below the belt-line and off to the side lies a ridge of bone that most of us can feel through the skin. This is the iliac crest and it is a bank of extra bone from which surgeons have made withdrawals for many purposes. The osteogenic potential of this bone is better than bone obtained from the skull, the tibia (leg bone) or the rib. More importantly, the *quantity* is much greater, especially when the bone graft is compressed as I always do. The skull simply cannot yield enough bone to really pack the alveolus, although some have advocated skull bone due to somewhat less soreness.

XIV. ORTHOGNATHIC SURGERY

words:

Le Fort I osteotomy: orthognathic procedure to correct the *upper jaw* position

sagittal split osteotomy: orthognathic procedure to correct the *lower jaw* position

Orthognathic surgery is corrective jaw surgery to improve the alignment of the jaws in such a way that the occlusion of the teeth is improved. This type of surgery is performed by surgeons with a dental background in addition to their surgical training. About 25% of unilateral cleft lip and palate children will ultimately require orthognathic surgery and somewhat greater percentage of bilaterals will need it. The timing of orthognathic surgery in cleft children is directed at a point when growth is at or near completion, i.e., age 16-17 for girls and 17-18 for boys. The *Le Fort I osteotomy* is the most common orthognathic

operation and it is designed to allow the entire upper jaw to be moved either as a unit or in segments to correct bite problems. The surgery is done entirely through the mouth with no external incisions. The upper jaw is freed of its attachments to the floor of the sinuses and is moved into its proper alignment with the lower jaw. It is then fixed in its new position with the use of tiny plates and screws made of titanium, that become a permanent part of the jaw structure. Additional bone grafts are often needed to add stability. Cleft teenagers with a severe “underbite” might also require a simultaneous operation on the lower jaw, a sagittal split osteotomy to move the lower jaw backward while the upper jaw is moving forward.

XV. FINAL RHINOPLASTY

Although the shaping of the nose is first addressed at the time of the lip closure and is again modified by the placement of the alveolar bone graft, the nose of a cleft person has a characteristic deformity that almost always requires yet another surgery to correct. After all the orthodontics and especially after orthognathic surgery, the nose is ready for a final “nose job”. The cleft nose is characteristically flattened on the side of the cleft with the tip lacking definition and support. The nostril on the cleft side may be *stenotic*, or narrowed, which is one of the most difficult components of clefting to correct. The final rhinoplasty is done at 18 or 19 years of age, but can be done at other times depending on the individual. I prefer to do this surgery through the “open” technique whereby an incision is made across the columella and then into the nostrils, allowing the skin over the nose to be lifted up. Cartilage is usually grafted from the nasal septum or from the ear to provide additional support.

XVI. QUESTIONS, ANSWERS AND CONSULTATION

I would be pleased to see you for a formal consultation in my office and this can be arranged by calling 224-1371 or 800-348-2727 (Western states) . I work with almost all of the pediatricians and orthodontists in the area, and my office participates with almost all of the managed care plans in the region.

It would be a privilege to provide care for your child.

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