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Surgical repair of the cleft palate

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The cleft palate is an important craniofacial defect resulting in direct functional deficits and is related to a variety of genetic syndromes. It varies in degree and clinical setting. Repair is important for oral and nasal function. This article describes methods for repair including 2-flap palatoplasty and V-Y pushback. Patient evaluation, postoperative care, and potential complications are discussed. Multidisciplinary team care is vital for these patients because of the variety of functions affected by this entity, and the need for timely diagnosis and intervention.

The cleft palate is an important craniofacial defect resulting in direct functional deficits and is related to a myriad of genetic syndromes. It occurs in approximately 1 per 2,000 live births and occurs in conjunction with a cleft lip or in isolation.[1] The deformity occurs most commonly in females secondary to earlier embryologic closure of the palatine processes in boys vs girls. Certain population subgroups have higher rates of the deformity; the highest percentage occurring in the American Indian, Asian, and White populations. Approximately one-third of patients with cleft palate have associated genetic syndromes, including velocardiofacial syndrome, van der Woude syndrome, and Stickler syndrome.

Two primary functional problems typically occur with cleft palate. Cleft palates create a single oral-nasal cavity, resulting in air escape with sucking and oral-nasal reflux. Breast-feeding is typically ineffective because of the lack of capability in developing adequate negative pressure, and specially designed nipples are typically employed (ie, Haberman and Pigeon bottles). Weight and growth must be monitored closely until all feeding difficulties are appropriately corrected.

Speech development becomes integral within the first few years of life and requires an intact oral cavity to create enough positive pressure used in articulation. Children with cleft palates develop compensatory mechanisms to create similar sounds, which if closed later, can affect future speech development. Early involvement with speech-language pathologists is paramount to any patient with cleft palate.

Cleft palate is a complex problem and it is integral that a team approach is employed for caring these patients. The cleft surgeon, orthodontist, pediatric dentist, pediatrician, oral surgeon, geneticist, and speech-language pathologist must periodically discuss each patient's comprehensive care.

Cleft palates are defined by the extent of involvement of the hard and soft palate and they range from subtle submucosal clefts with minimal discernible defect to complete bilateral clefts with a mobile premaxilla and continuity with the nasal cavity.

Patient evaluation

Many cleft palates continue to be diagnosed at birth; however, with the continual improvement in prenatal

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ultrasound, a higher percentage of patients are being diagnosed in the antenatal period. Submucosal clefts are much more subtle and may not be diagnosed until a much later stage, after adequate speech development or with the presence of velopharyngeal insufficiency in a patient who underwent adenoidectomy.

A complete head and neck examination should be performed including a thorough oral cavity examination identifying subtle abnormalities, including a zona pellucida, a bifid uvula, or a palpable notch in the posterior palate suggestive of a submucosal cleft. Nasopharyngoscopy during active speech is a powerful adjunct in diagnosing subtle cleft palates and should be coordinated with a licensed speech-language pathologist. The cleft should be defined and may be described using an appropriate cleft palate grading system depending upon the surgeon. Many classifications systems have been developed to define the extent of clefting and surgeons may find this useful. For example, the most commonly used system is the Striped Y classification by Kernahan that defines the presence of clefting along a "Y" where the right and left upper limbs represent the respective lip, alveolus, and hard palate anterior to the incisor foramen (superior to inferior). The base represents the hard palate posterior to the incisor foramen, soft palate, and submucosal region (superior to inferior).[2] Many additional systems have developed as modifications of the original striped Y classification.

Otoscopy and diagnosis of serous otitis media is essential given that mal-insertion and hypoplasia of the tensor veli palatini muscle predispose these children to Eustachian tube dysfunction. Lastly, other signs of associated syndromic findings should be identified. These can include retrognathia in Pierre Robin syndrome, ocular abnormalities in Stickler syndrome, and medialized carotid arteries in velocardiofacial syndrome. It is essential to identify these syndromes before consideration of operative intervention as additional malformations may complicate anesthesia or alter the operative plan.

The goal of cleft palate repair is 3-fold: separation of the oral and nasal cavities, realignment of the levator muscles to create a functional sling and decrease velopharyngeal insufficiency, and to eventually allow proper dental occlusion. The corrective surgeries are constantly evolving with our better understanding of the embryology, anatomy, and associated facial and language development.

Surgical options

There are 3 primary palate repair types being used today by most surgeons, of which 2 are focused upon in this article. They are the 2-flap palatoplasty and V-Y pushback. The double-opposing Z-plasty can be referenced in Chapter X: *Surgical Management of Velopharyngeal Dysfunction*.[3]

The V-Y pushback effectively closes a wide cleft, lengthens the anterior soft palate but leaves anterior palate bone exposed, increasing the risk of nasal fistula formation. The 2-flap palatoplasty effectively repairs wide clefts but does not result in anterior bone exposure. The double-opposing Z-plasty is very effective at levator veli palatini muscle alignment but does not effectively close wide hard palate clefts. It therefore functions well in the treatment of soft palate and submucosal clefts.

The appropriate timing of cleft palate repair is a challenging decision to make and one of continuous debate because the studies analyzing timing demonstrate variable results.[4] It requires balancing the risk of impaired dental arch development likely secondary to exposed bone of the palate if surgery is performed too early, vs possible speech development delays if surgery is performed later.[4] Additionally, patients with airway concerns are at risk for postoperative exacerbation of obstructive symptoms and would benefit from a delayed repair. Currently, it is recommended to repair the palates between ages of 7 and 18 months.[5]

Surgical technique

Two-flap palatoplasty

After the 2-flap technique is chosen and the family is educated about the surgery, the patient is prepared preoperatively so that an optimal weight is met. The patient is placed in Rose position, allowing adequate extension of the neck. A rolled up towel placed underneath the neck can assist in this neck extension (Figure 1). A Dingman retractor is introduced into the oral cavity. Local anesthesia with epinephrine (0.25% ropivicaine with 1:100,000 of epinephrine) is injected along the palatal edges and the greater palatine on either side is also targeted. Hydrodissection is usually clearly evident by blanching of the mucosa. The incision is marked using methylene blue on a sharpened end of a cotton swab (Figure 2). Initially the medial edges of the uvula are excised with a curved tenotomy scissors, which allows recreation of a neo-uvula at the completion of the procedure (Figure 3). Using a fine-toothed forceps, a slight caudal retraction provides tension for a more precise cut. Beginning at the maxillary tuberosity on either side, the incision is made proceeding anteriorly, along the medial aspect of the gingiva in a groove toward the midline, where it then follows the medial edge of the cleft. The senior author has chosen to use Bovie electrocautery on *cut* mode for the mucosal incision, although a Beaver blade is just as effective but may induce more blood loss. When incising the mucosa along the palatal cleft it is important to incise with the intent of leaving slightly more nasal mucosa down so that adequate closure of this layer is achieved at the end. Once the mucosa has been incised, a Woodson elevator is used to bluntly dissect the oral mucosa from the hard palate anterolateral to posterior. It can be helpful to begin laterally at the anterior tip of mucoperiosteal flap because the medial edge is typically more adherent to the hard palate. It is important to avoid trauma to the tip of the flap as it can have a tenuous blood supply. Once elevation of the medial portion is achieved, sharp dissection with a No. 15 blade can