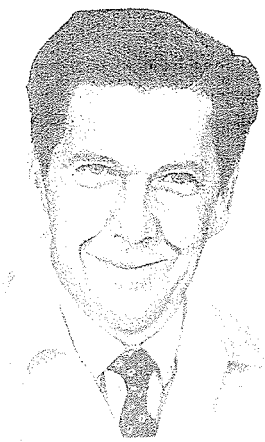
51. Flaps and Free Grafts of Distant Muscle, Tendon and Fascia

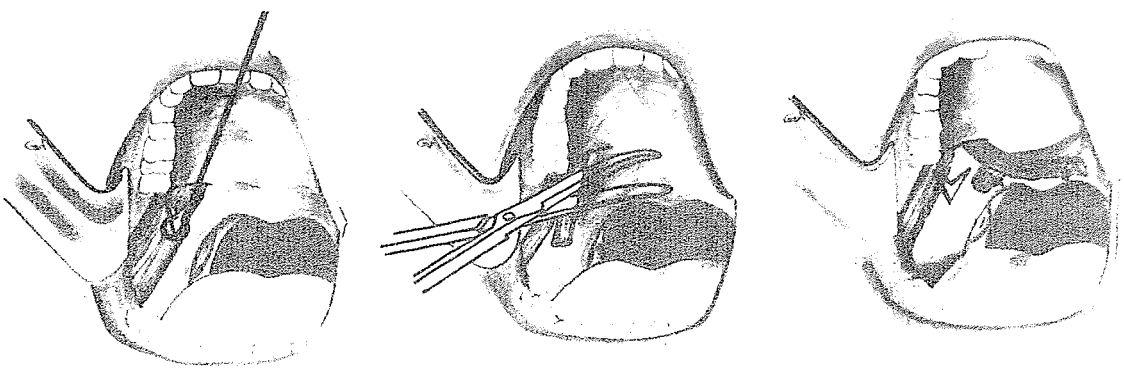
IN the heroic attempt to impart some extra dynamic action to the velopharyngeal sphincter, various extrapalatal muscle, tendon and fascia flaps and free grafts have been used. Although the dynamic action has been questionable in most cases, each method deserves consideration.



Otto Neuner

LATERAL MUSCLE TRANSPOSITION

Imaginative Otto Neuner of Berne has developed a procedure he calls "levatorplasty." He claims to improve the levator function by dissecting out the medial pterygoid muscle on each side and transposing them in a crisscross, so that they embrace arm in arm in the body of the velum.

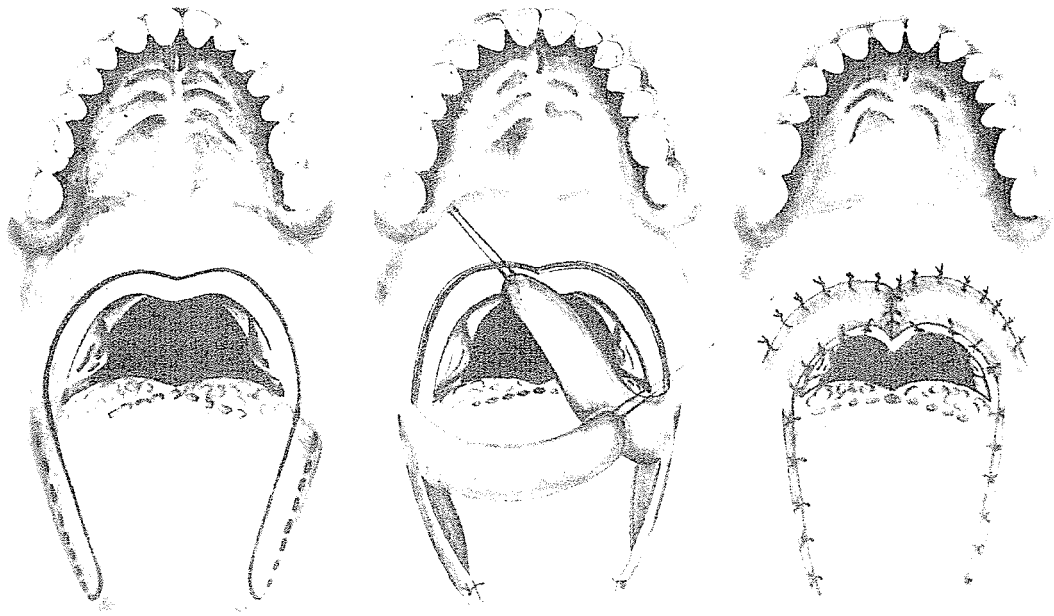


This operation was performed by Neuner

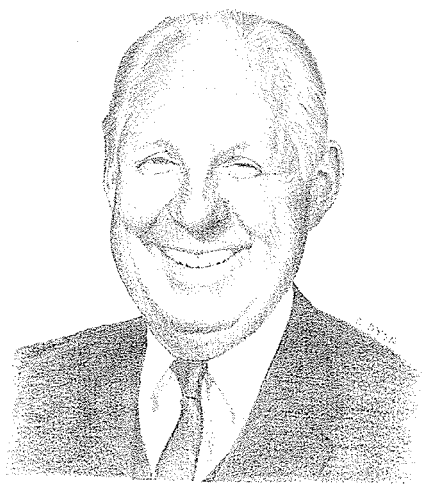
in 8 cases with excellent results as regards to consonants and satisfactory ones as regards to vowels.

LATERAL TONGUE FLAPS

Neuner has also designed a use for the tongue in velopharyngeal incompetence. He entitled this procedure "arcus palatoglossus-plasty." It attempts to thicken the anterior tonsillar pillars and increase the mobility of the arch by inserting "a pedicle musculo-mucosal flap" from the lateral margins of the tongue. Neuner reported this operation,



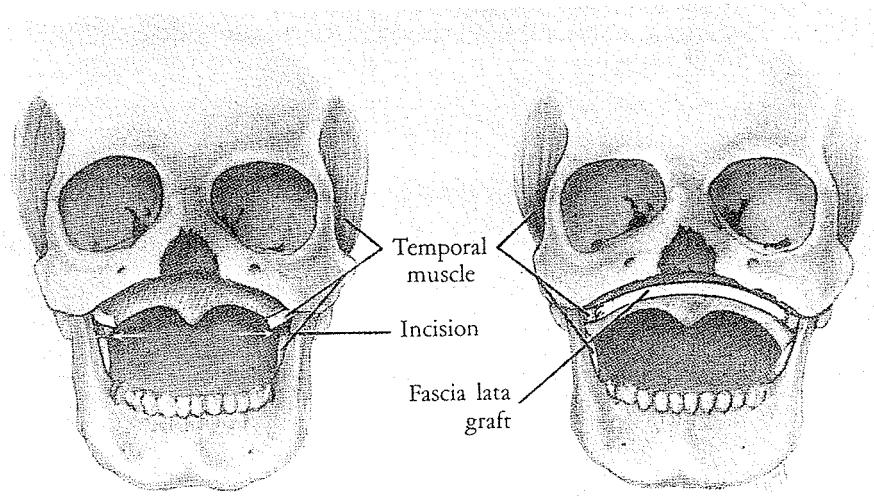
always in two procedures, was performed in 8 cases with speech improvement to normal phonation. This lateral partial glossectomy contributed to these end results, most of the patients suffering from a certain degree of compensatory macroglossia.



Clifford Kiehn

TEMPORALIS MUSCLE AND FASCIA

Clifford L. Kiehn, plastic and maxillofacial surgeon and an important leader of American plastic surgery, in 1965 with J. DesPrez, A. Tucker and M. Malone of Western Reserve University, Cleveland, Ohio, presented a study of 19 patients aged 6 to 16 years, in whom muscles supplied by the fifth cranial nerve (temporalis in 17 and masseter in 2) had been transplanted into the soft palate through use of an intervening fascia lata graft from the thigh. They reasoned:

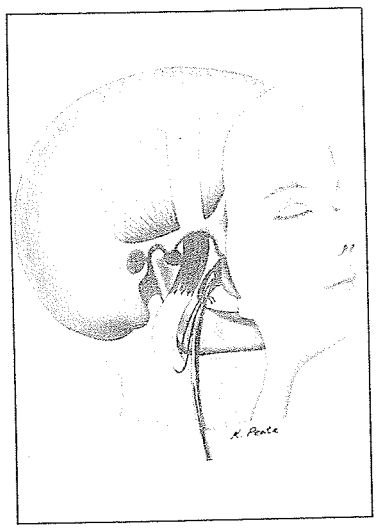


John Des Prez

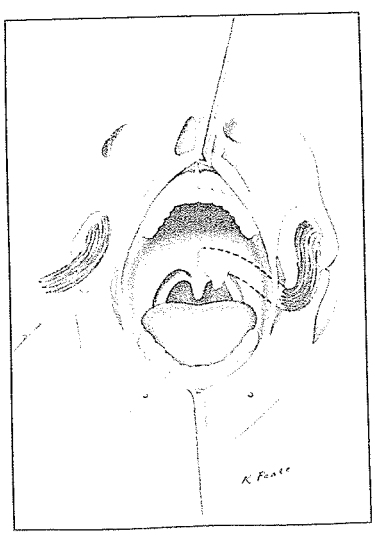
If the palate could be elevated to the superior position to diminish the nasopharyngeal space without interfering with normal physiologic function of this area and if some dynamic mobility could be added to complement or replace the static function of the nasopharyngeal flap, this would constitute a most desirable surgical procedure.

They noted no deterioration in speech function following the procedure and reported:

In four cases, improvement was negligible or extremely slight immediately after operation. In 15 patients, there was definite improvement which was encouraging or satisfactory, according to our clinical impressions and the opinions of family, friends and teachers. It appears to us that the best results so far have been obtained in patients with paralyzed palates or without true clefts (*forme fruste*).



By 1971 Kiehn, DesPrez, Maes and Kronheim had modified their method by peeling the superficial fascia upward and leaving it attached to a strap of temporalis muscle based inferiorly, to create a long component as described by Gillies for lagophthalmos. They created the musculofascial components bilaterally and threaded them under the arch of the zygomas, medially through the soft palate to the median raphe, and sutured them to each other. In 50 cases, they reported, these temporal transfers had



improved naso-pharyngeal valving, preventing more air from escaping through the nose during utterance of sounds and words.

Cliff Kiehn wrote in 1976:

I believe many of our cleft palate failures after closure are not due entirely to the surgical technique, but to a hypoplasia of musculature. This is particularly true in the adult unoperated cleft palate where the soft palate is not developed because of lack of normal positioning and the atrophy of disuse. Biopsies of these palates show deficient muscular structure. This gave me the idea to find a nearby muscle supplied by a different nerve to add to the dynamics of the palate. I chose the temporalis muscle because of its success in facial paralysis by Gillies. Originally, I took the temporalis muscle off the coronoid process, and put the fascia from the thigh in the soft palate and hooked it up to the temporal muscle on each side. It seemed to work very well. . . . Then as time went on, I used the temporal muscle and fascia, as used in 7th nerve palsy,. and threaded them into the soft palate. It is important to use as large a muscle as you can get under the zygomatic arch, and the shorter the fascial attachment, the better. It is practically impossible to get muscle to muscle in the midline of the soft palate because of its width. Of course, it does not produce ideal speech in every case but I think that it can be a valuable adjunct. . . . I have found this surgical procedure very helpful in people with cleft palate speech without cleft palate, following removal of tonsils and adenoids. There is not one of them who has not been improved in their speech.

Finally, never underestimate the power of gravity. That is why I believe in dynamic and static slings in facial paralysis and this same principle can also be applied to cleft palate surgery. Back in the fifties, Emlyn Lewis of Wales joined Pete Moran on a panel, with each giving papers on muscle-fascial slings in facial nerve palsy. Lewis, as guest, went first and showed excellent slides of results of closure of the eyelids and function of the corner of the mouth. Then Moran rose and gave his paper on the same subject and his results were even better. As a matter of fact they were practically perfect. After the discussion Moran confessed to the audience that his slides had been made with his patients standing on their heads with gravity working, as well as the dynamics of the muscles. This, of course, brought the house down. I have also noticed that if you stand your cleft palate patients on their heads they will talk better, and I have done this with my little kids many times.

THOMPSON

Noel Thompson of Middlesex Hospital, England, since 1968 has carried out extensive work in free autogenous muscle grafts and in 1971 published his principles, reiterated in 1974:

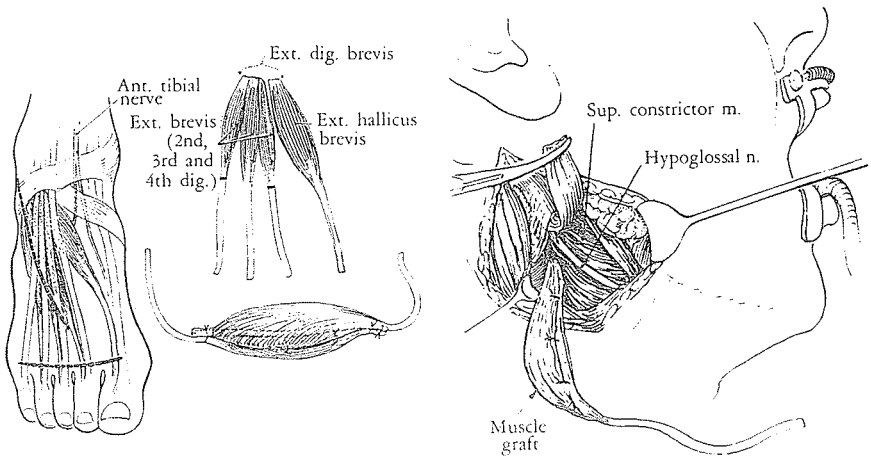
(1) the muscle graft must be transplanted as a complete muscle belly to

preserve the entire length of its constituent fibres; (2) it must be denervated 2 weeks before transfer; and (3) it must be applied at the recipient site to normal striated muscle from which reinnervation of the graft can occur.

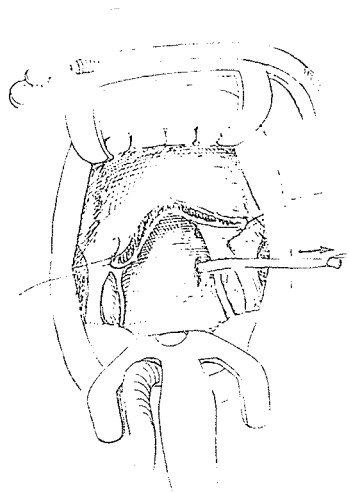
He presented his use of this concept in the treatment of velopharyngeal incompetence with speech specialist Lesley Mathieson at the International Congress on Cleft Palate held in Copenhagen in 1973. It was published in *Clinics of Plastic Surgery* in 1974.

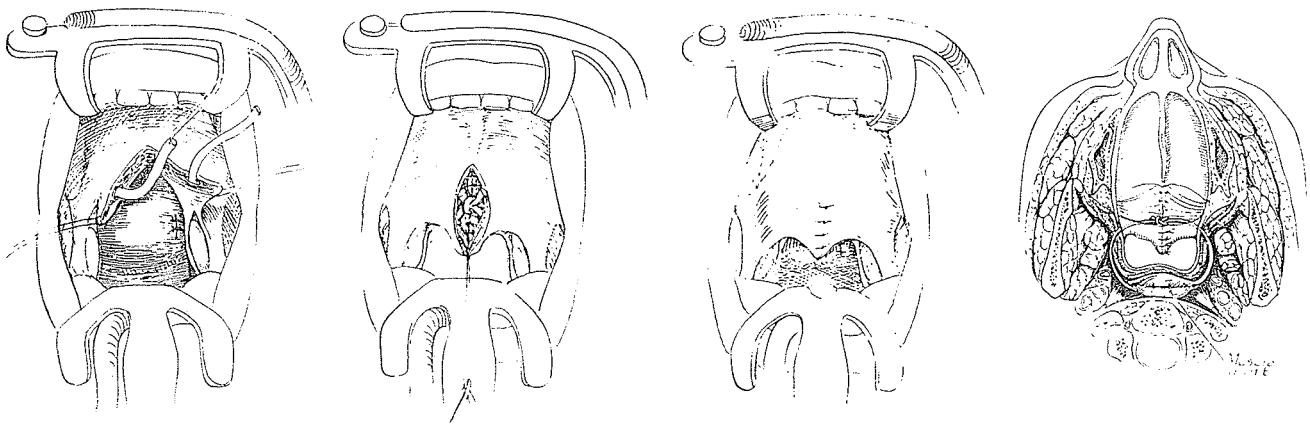
and again in 1979

The theory of a velopharyngeal purse-string as an aid to speech was first presented by Denis Browne of London using a strong chromic catgut suture. Thompson chose as his purse-string a



musculotendinous complex from the foot. The four muscle bellies of the extensor digitorum brevis muscles of the foot were taken and sutured together to provide a leading and a trailing tendon, between which a bridging segment of surplus tendon was sutured to protect graft muscle fibers from traction stress. Then, through a 5 cm. external cervical incision parallel to the anterior border of the sternocleidomastoid muscle, the posterior belly of the digastric was elevated so that dissection could be made behind the hypoglossal nerve across the lateral pharyngeal space to create a roomy pocket above the superior constrictor muscle, at a level behind the upper border of the anterior arch of the atlas. The soft palate was split, and an incision in the posterior pharyngeal wall allowed pullout of the tendon and threading of both tendon ends around the lateral pharynx and through the soft palate to be tied together in the middle.





This was the 1974 claim on seven cases followed for periods of nine months to three years:

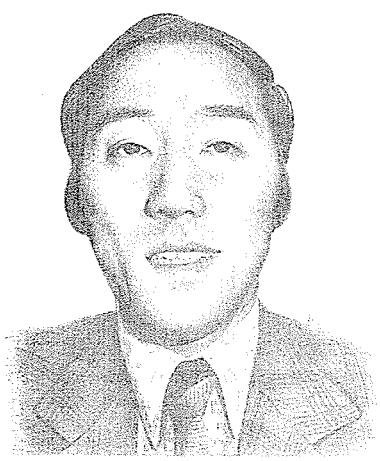
While improvement in speech was present at all stages, contractile function only became visible in the graft after about 6 months, and speech improved up to 1 to 1½ years postoperatively. . . . *Lateral Pharyngeal [vocal] Cineradiography* . . . demonstrated improved velopharyngeal closure with sphincteric competency (broad closure in four patients, touch closure in three patients) being obtained in all cases treated.

Bertram Bromberg

BROMBERG AND SONG

Some years ago it occurred to Bertram E. Bromberg of Long Island, New York, to use the palmaris tendon to encircle the pharynx. By attaching the tendon to the anterior belly of the digastric in the region of the hyoid bilaterally, he hoped to get both a dynamic and a static force. During speech, with the mouth opening and closing, the tendon would be stretched and would thus constrict the pharynx with a dynamic action from the anterior digastric. Bromberg recalled in 1976:

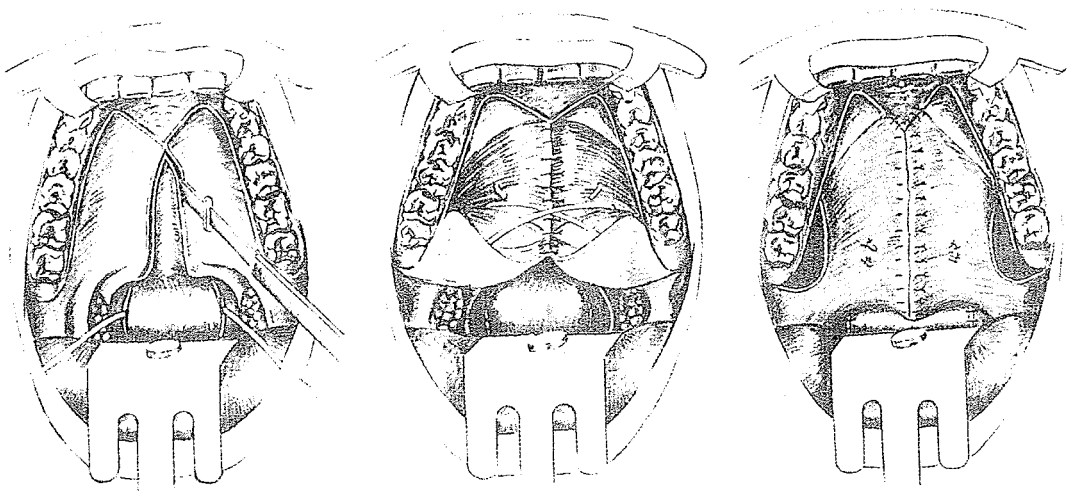
Unfortunately, the placement was unphysiological and the direction of pull too low. It was only after Thompson's work that we went back to palmaris longus muscle for use in a pharyngo-palatoplasty.



Chul Song

In 1974 in the *British Journal of Plastic Surgery,* Chul Song and Bertram E. Bromberg described the use of the palmaris longus muscle of the arm as the purse-string for velopharyngeal incompetence. They carried the procedure out in conjunction with a three-flap Wardill pushback palate closure in three cases.

The muscle belly was introduced in a pocket behind the posterior pharyngeal wall, and the tendon extensions were brought around and inserted into the contralateral levator musculature to act as a type of purse string.



Their discussions and conclusions are of interest:

This [type of muscle transplant pharyngo-palatoplasty] offers three distinct advantages:

The soft palate lengthening gained by the pushback procedure is maintained by the tedinous traction provided by the transplant. [Thus permanent sufficient length of velum to effectively function as a flap valve mechanism is provided.]

Augmentation of the posterior pharyngeal wall results in permanent narrowing of the velopharyngeal space. . . . In Thompson's (1971) description, only denervation precedes transplantation and re-innervation is generally anticipated. We found it extremely difficult to obtain pure denervation and it would appear that devascularisation is a frequent accompaniment. Even if survival of the entire muscle does not occur, the bulk effect is not lost, because of fibrous tissue replacement although the chances of dynamic function are obviously reduced. Electromyographic studies 6 months and 1 year after muscle transplantation did not reveal any active action potentials.

A correct anatomical and physiological type of reconstruction is created and should provide the same form of movement as in the uncleft individual, particularly if re-innervation is indeed possible; if it is not, as least bulk is obtained in the area of Passavant's ridge and by means of the functioning levator and superior pharyngeal constrictors a good anteromedial motion of the pharyngeal walls provides a satisfactory purse string effect.