

# Plastic and Reconstructive Surgery of the Head and Neck

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### Dual Simultaneous System-2: A New Technique for Facial Reanimation in Total Proximal Facial Nerve Paralysis

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## CHAPTER 115

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The concept of dual simultaneous system (DSS) reanimation for distal facial nerve paralysis is well established and has proved successful for many years. However, this procedure is limited to those cases in which the proximal facial nerve is intact.

Dual simultaneous system-2 (DSS-2) incorporates the same underlying concepts and tenets as DSS for achieving successful reanimation in patients in whom the proximal facial nerve is destroyed or nonfunctional. This is accomplished by masseter muscle transposition for reanimation of the lower face, combined with a split hypoglossal nerve reanastomosis with the upper division of the facial nerve, to reconstruct the upper face.

Since 1983, eighteen patients have been successfully reanimated with this technique with remarkable success.

### MATERIALS AND METHODS

The surgical goal of reanimation is to restore both aesthetics and function to the paralyzed face. The primary concerns are physiologic, with the closure of the eye and the competence of the oral sphincter being of utmost importance. Secondarily, but also important, especially to the patient, are the cosmetic aspects of a normally functioning face. It is impossible with any currently available facial reanimation procedure to even approximately duplicate the immense diversity of facial expressions that are deemed "normal." Instead, the intelligent surgeon must be content to simulate a near-normal physiology of facial movement with an adequate cosmetic effect.

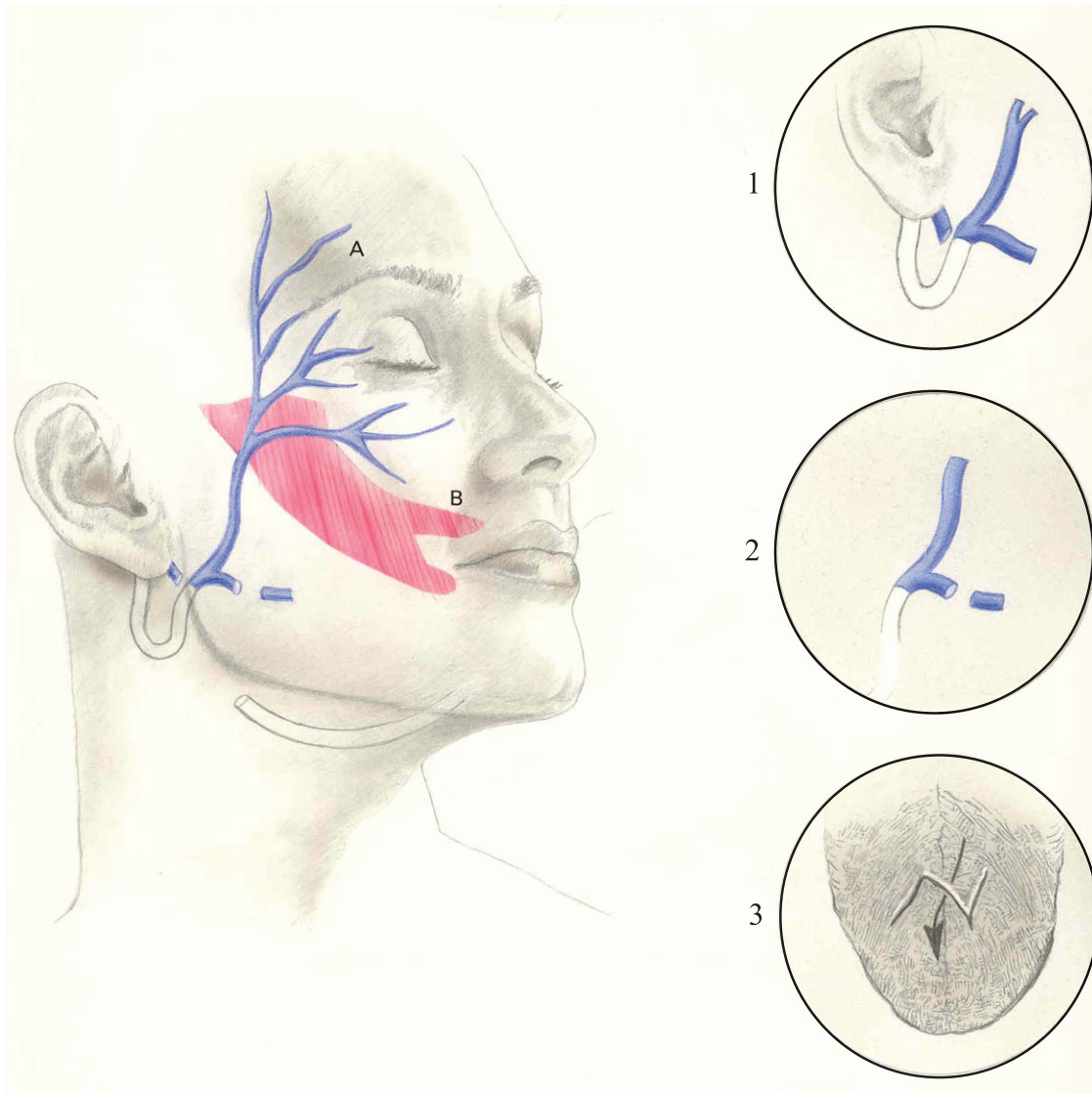
These goals are accomplished by allowing the orbicularis oculi muscles to close and to impart competence to the oral sphincter, so that speaking and eating are readily handled. Cosmetically, the goals are more elusive but should include the restoration of normal facial tone and the ability to communicate socially by smiling.

Successful reanimation requires the use of an operative procedure that will allow mimic of natural physiologic movement. Normally the eyes and the mouth move independently. When blinking, the mouth does not move and when smiling or eating, the eye does not close. To simulate this discrimination of movement, a new reconstructive procedure was developed to intrinsically direct these different functions, DSS-2 divides the face into two functional spheres, an upper periorbital area, and a lower perioral region. The integral system includes a direct anastomosis of a split hypoglossal nerve to the upper division of the facial nerve, for the upper sphere, combined with a masseter muscle transposition for the lower region. By treating the upper and the lower zones of the face separately, patients regain a more natural facial expression and more coordinated physiologic movements.

### TECHNIQUE

To reanimate the upper facial zone, the hypoglossal nerve is split and reanastomosed to the upper division of the facial nerve (Fig. 115-1). By splitting the hypoglossal nerve instead of taking the whole nerve (as is done in the hypoglossal crossover operation), tongue movement remains normal. To restore lower face movement, the masseter muscle is divided into two parts and moved into the oral region. One part with its accompanying nerves derived originally from the fifth cranial nerve, is positioned above the mouth, and the other part is positioned below the mouth (see Fig. 115-1).

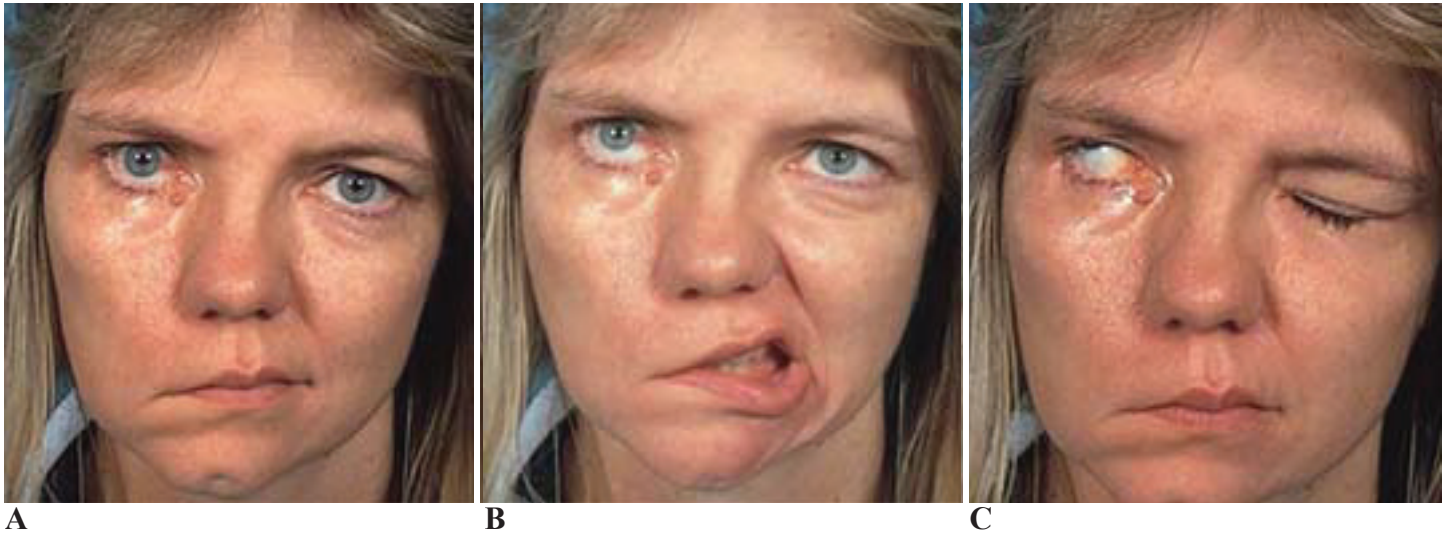
The masseter muscle functions almost immediately after the operation. A near normal smile is achieved by a self training program of looking in the mirror while smiling. Eventually, through this type of biofeedback, the brain will



**Figure 115-1** Dual Simultaneous Systems 2. This figure displays the complete Reanimation System combining the split hypoglossal nerve connected to the upper division of the facial nerve **A**, with a masseter muscle transposition **B**.

realize that the chewing muscle is now in a new location and will allow the patient to smile at will. The nerve graft to the eye take about 9 months to impart some tone and about 12 months for movement to begin. During this interim, the eye can be managed with symptomatic treatment and patient education regarding protection and lubrication. In older patients, a lateral canthoplasty can be performed until full movement and tone are operational, In approximately 18 months movement of the periorbital muscle is achieved as well as the all important involuntary blink function. During the next 6 months a coordinated facial movement takes place with both systems blending together and working as a team. The inherent difference in the nerve supplies of the two systems cranial nerves 5 and

12 obviates the terrible disabling hemifacial spasms than can occur with the hypoglossal transposition alone. The final stage of reconstruction occurs as the fine nerves flow out from the transposed masseter muscle into the surrounding facial muscle giving them increased tone and eventually purposeful movement adding to the repertoire of expressive facial motion. This myoneurotization also inhibits further atrophy of the face and aids in the regionalization of movement. The entire sequence of events usually reaches its peak potential in approximately 2 years, when the patient is able to incorporate his understanding of the situation into the physiologic potentials laid down during the initial operation (FIG. 115-2)



**Figure 115-2** Preoperative views of patient with total facial nerve paralysis secondary to acoustic neuroma surgical ablation. **A.** At Rest **B.** Smiling **C.** Closing Eye



**Figure 115-2.** Postoperative views of patient 2 years after dual simultaneous systems reanimation. **D.** At Rest **E.** Smiling **F.** Closing Eye. (*Note the excellent facial tone and regionalized discrimination of movement*)

**DISCUSSION**

The successful reanimation of the permanently hemiparalyzed face is perhaps the most challenging technical procedure that facial plastic surgeons perform. The exquisite complexity of the facial motor system allows for an endless variety of emotional expression as well for providing eye protection, and control of speech, food, and saliva. The exact duplication of this system is all but impossible, but by using the techniques described above, a remarkably natural reconstructive result can be routinely accomplished.

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