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tivity of 93% and a specificity of 98% for proximal vein DVT. Deep vein thrombosis is common in postoperative patients (20–50%) and results in pulmonary embolism in 10 to 15% of patients with DVT.¹ The widespread, accepted use of duplex scanning for the detection of DVT acknowledges the need for noninvasive, less costly methods in the diagnosis of even potentially fatal conditions.

We have not proposed that MR imaging be the gold standard for the determination of obliteration of AVMs after stereotactic radiosurgery; rather, we stated that “the diagnosis of AVM patency after radiosurgery still depends on conventional cerebral angiography when only a small residual nidus remains.” Assuming that postradiosurgical MR imaging is 95% accurate, the number of quality-adjusted life years lost due to an undetected patent AVM equals that from the complications of angiography in only 1.5 years, if the expected complication rate of DSA is 0.3% (J. Campbell and M. Rutigliano, personal communication). Thus, we continue to advise our patients with AVMs to undergo follow-up DSA after radiosurgery to confirm obliteration of the AVM if MR imaging suggests obliteration. For patients with obvious flow void abnormalities detected on MR images 3 or more years after radiosurgery, we no longer advise routine diagnostic DSA. Instead, we encourage such patients to undergo follow-up DSA after placement of a stereotactic frame, thereby allowing repeated radiosurgery to be performed if residual nidus is detected. This protocol for performing follow-up DSA has reduced the number of unnecessary angiograms in our patients with AVMs.

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References

1. Weinmann EE, Salzman EW: Deep-vein thrombosis. *N Engl J Med* 331:1630–1641, 1994
2. White RH, McGahan JP, Daschbach MM, et al: Diagnosis of deep vein thrombosis using duplex ultrasound. *Arch Intern Med* 111:297–304, 1989

Hypoglossal–Facial Nerve Anastomosis

TO THE EDITOR: We read with great interest the paper by Sawamura and Abe (Sawamura Y, Abe H: Hypoglossal–facial nerve side-to-end anastomosis for preservation of hypoglossal function: results of delayed treatment with a new technique. *J Neurosurg* 86:203–206, February, 1997).

Although hypoglossal–facial nerve side-to-end anastomosis is a widely accepted and used procedure for restoration of facial movements, it is our opinion that the word “anastomosis” is wrongly applied in reference to nerves. It has been 17 years since the *Journal of Neurosurgery* published a letter by Rosegay and Edwards¹ that detailed the correct terminology of different types of peripheral nerve repair. This letter focused on the confusion between the terms “fascicular suture,” “interfascicular suture,” “in-

terfascicular nerve grafting,” “grouped fascicular suture,” and “funicular suture.” We have noticed, however, that the neurosurgical and microsurgical literature has continued to observe the incorrect terms for “nerve repair,” or the surgical procedure intended to restore the continuity of a (partially) divided nerve. These terms include the word “anastomosis,” found in many papers on experimental and clinical nerve repair, as well as “reanastomosis,” “suture,” “coaptation,” and “approximation.”

According to Stedman’s Medical Dictionary, the term “anastomosis” means an “operative union of two hollow structures.”² This definition does not include solid structures such as nerves. “Suture” (to unite two surfaces by sewing²) should also be avoided as a term for nerve repair, because it merely specifies the kind of technique by which the nerve ends are repaired rather than the process as a whole; the same rationale applies to such terms as “gluing,” “laser welding,” “fusion,” “tubulization,” and “wrapping.” With this argument in mind, “fibrin suture” is a contradiction in terms. “Coaptation” (the joining or fitting together of two surfaces²) and “approximation” (tissue edges drawn into desired apposition for suturing²) are also incorrectly applied to nerve repair, as they both refer to the drawing together of nerve ends without further mechanical stabilization; not surprisingly, this is very rarely the case in peripheral nerve repair. “Neurorrhaphy,” a term mainly popular in the 1950s and early 1960s, would be a very appropriate term, because it refers to the “joining together, usually by suture, of the two parts of a divided nerve.”² However, this term excludes nerve repair not performed via suturing, such as techniques that use fibrin glue, laser, or other sutureless methods.

Terms that appropriately describe the whole process are “repair” (restoration of damaged tissue . . . artificially, as by surgical means²), “reconnection,” or “reconstruction.” Fortunately, these terms are already used by many experts in nerve surgery. These terms can be preceded or followed by a specific term indicating the technique (such as epineurial or perineurial) or material (including sutures and fibrin adhesive) by which the nerve repair is performed, or the sort of nerve repair (such as hypoglossal–facial nerve, cross–facial nerve, end-to-end, graft).

With current technical progress and developing subspecialties creating many new (pseudo)scientific words, we must be careful to use the most precise terminology possible. An incorrectly used term, once adopted, is very hard to eradicate from the language. This issue may also present a task for editors and reviewers of neurosurgical journals to correct wrongly applied terms for cranial and peripheral nerve repair.

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References

1. Rosegay H, Edwards MS: The language of neurorrhaphy. *J Neurosurg* 52:143–144, 1980 (Letter)
2. *Stedman’s Medical Dictionary*, ed 25. Baltimore: Williams & Wilkins, 1990

TO THE EDITOR: We would like to comment on the arti-

cle by Sawamura and Abe (Sawamura Y, Abe H: Hypoglossal-facial nerve side-to-end anastomosis for preservation of hypoglossal function: results of delayed treatment with a new technique. *J Neurosurg* 86:203-206, February, 1997) in which the authors try to demonstrate that their technique can overcome the biological problems related to long-lasting facial paralysis and preserve hypoglossal function.

Hypoglossal-facial anastomosis is a well-known procedure used to reanimate the face. When it is performed early, for instance, within 6 months after facial nerve injury, results are good in terms of facial symmetry and voluntary eye closure. Recovery of the frontalis muscle is generally poor. The hemitongue atrophy that follows this procedure is variable in intensity and is generally well tolerated by the patients. Normally, dysfunctions in eating, swallowing, and speaking are not noted as a direct consequence of hemiglossal palsy.³ With the exception of patients with previous lower cranial nerve dysfunction, we believe that hemitongue atrophy is overemphasized by those surgeons who propose technical modifications of the conventional hypoglossal-facial nerve anastomosis. The first modified technique was the anastomosis of the descending hypoglossal branch to the distal stump of the hypoglossal nerve trunk. This technique probably represents the best option because facial reanimation is privileged over hypoglossal function and is attempted only to limit the hemitongue atrophy.

All the other modified procedures seem to be aimed mainly at limiting the hemitongue atrophy or hemiglossal dysfunction rather than at obtaining the best reanimation of the face using all the axons of the donor nerve. A technique that uses one-half of the hypoglossal nerve with or without interpositional nerve graft has been presented only in small series (Arai, et al.,¹ eight cases; Cusimano and Sekhar,² one case) and to some criticism.³ May, et al.,⁴ presented a more consistent series using a simple interposition of a nerve graft between the facial and the hypoglossal nerve. None of these techniques has become popular because the best neurotization procedure to reanimate the face remains the classic hypoglossal-facial nerve anastomosis. The paper by Sawamura and Abe is another example of technical innovation presented in a very limited number of cases. All four patients had complete facial palsy or House-Brackmann Grade VI. The mean duration of the facial paralysis was greater than 24 months. Surprisingly, this procedure, in which basically one-half (or two-fifths) of the hypoglossal nerve is anastomosed to the facial nerve at a more proximal level, was successful in those patients with long-standing facial palsy. Recovery of the frontalis muscle was observed in two cases. Tongue atrophy was avoided in all four cases. The key issue addressed by this paper would appear to be the anatomical level of the anastomosis that is more proximal than that used in conventional techniques for either the facial or hypoglossal nerves. However, the authors do not elucidate the mechanisms through which the level of the anastomosis may affect both facial function recovery and hemitongue trophism preservation. Conversely, the discussion section hypothesizes that two of the three patients with long-standing facial palsy who improved after surgery probably had some spared axons that maintained the

trophism of the facial muscles. In other words, in these cases there was not a complete lesion of the facial nerve, thereby suggesting that good results could be achieved using the conventional technique as well. Furthermore, the absence of hemiglossal atrophy in a series of only four cases does not prove that the authors' technique is superior to that of May and colleagues,⁴ who reported hypoglossal dysfunction in only three of 20 cases after treatment via their technique. We believe that this article's conclusion that "the hemiglossal-facial nerve side-to-end anastomosis constitutes a successful treatment for patients with long-standing facial paralysis" is not correct and that articles such as this one would be better presented with electrophysiological data.

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References

1. Arai H, Sato K, Yanai A: Hemihypoglossal-facial nerve anastomosis in treating unilateral facial palsy after acoustic neuroma resection. *J Neurosurg* 82:51-54, 1995
2. Cusimano MD, Sekhar L: Partial hypoglossal to facial nerve anastomosis for reinnervation of the paralyzed face in patients with lower cranial nerve palsies: technical note. *Neurosurgery* 35:532-534, 1994
3. Fernandez E, Tamburrini G, Romeo F: Pathology of the peripheral nervous system. *Crit Rev Neurosurg* 7:58-75, 1997
4. May M, Sobol SM, Mester SJ: Hypoglossal-facial nerve interpositional-jump graft for facial reanimation without tongue atrophy. *Otolaryngol Head Neck Surg* 104:818-825, 1991

RESPONSE: I appreciate the opportunity to respond to the letters by Dr. Fernandez, et al., and Drs. Menovsky and Overbeeke regarding our recently published article, and I thank them for their comments.

I agree with the comments of Dr. Fernandez and colleagues that the hemitongue atrophy following classic hypoglossal-facial nerve end-to-end anastomosis is variable in intensity, is generally well tolerated by patients, and has been overemphasized by some surgeons. Nevertheless, the recent technical advancement of partial hypoglossal-facial nerve anastomosis, including our technique, enables us to preserve hypoglossal function with minimal, or even no tongue atrophy.^{1,2,4,5} Classic hypoglossal-facial nerve anastomosis scarifying the hypoglossal nerve is now thought to be inferior to these more modern techniques that leave the hypoglossal trunk at least partially intact.

Another well-known modified technique is the anastomosis of the descending hypoglossal branch to the distal stump of the hypoglossal nerve trunk, which is used to restore hypoglossal function after facial nerve repair. This technique can theoretically preserve hypoglossal function. In reality, however, it has often resulted in hemiglossal atrophy with its dysfunction. This may be due to the great difference in the total number of myelinated fibers between the descending branch and the distal hypoglossal trunk.

I have been performing an anatomical study in collabo-

TABLE 1

A survey of key words found in 4988 papers concerning the facial nerve published between 1966 and June 1997*

Key Words	No. of Papers
anastomosis	155
English language paper	113
human study	92
repair	134
English language paper	108
excluding term "anastomosis"	84
human study	78
reconstruction	114
English language paper	79
excluding term "anastomosis"	70
human study	75
neurorrhaphy	8
English language paper	7
human study	7
reconnection	1

* Data culled from the Medline database.

ration with Dr. T. Fukushima at Allegheny General Hospital, which uses cadavers donated in Japan and the United States. Our preliminary results show that, on average, there are approximately 7000 myelinated fibers in the mastoid portion of the normal (not injured) facial nerve, whereas the hypoglossal trunk at its high cervical portion has approximately 11,000 of these fibers (unpublished data). These data indicate that if half of the hypoglossal nerve is cut, it can still supply a sufficient number of myelinated motor nerve fibers to an injured and atrophic facial nerve stump, as shown in Fig. 1 of our article⁵ and as Hitselberger³ has mentioned previously. In addition, our technique does not require that the hypoglossal nerve be split for any distance, which further enhances the integrity of the nerve and reduces the degree of hemiatrophy of the tongue.³ For a nerve-to-nerve anastomosis, both the consistency of the nerve stump calibers and the number of myelinated fibers are important factors. Using all of the donor hypoglossal nerve is not necessary. In this regard, our technique aims not only at limiting hemiglossal dysfunction, but also at obtaining the best reanimation of a paralyzed face.

As Fernandez and colleagues have mentioned, the key to the success of our technique may be that the anatomical level of the anastomosis is more proximal than that used in classic techniques for the facial nerve. Currently, I cannot discuss the electrophysiological data for the method by which the anatomical level of the anastomosis may affect the postsurgical function of both the facial nerve and the hypoglossal nerve. Our anatomical study, however, shows that the mean distance between the ansa of the facial nerve and the high cervical anastomosis point on the hypoglossal nerve is approximately 25 mm (unpublished data). Throughout this distance, the paretic facial nerve must be reinnervated from the hypoglossal trunk at the extremely high cervical portion. This distance is, however, shorter than that required in other reported techniques.

Although the series that we presented was small, this technique can also be used in patients with "short-standing" facial paralysis. Our recent experience with these

patients shows that the recovery of facial nerve function is faster in patients with short-standing facial paralysis than in those with long-standing facial paralysis (unpublished data). As more surgeons become experienced with our technique, its value will become apparent.³

I agree with the point made by Drs. Menovsky and Overbeeke that the word "anastomosis" is wrongly applied in the context of nerves. According to Stedman's Medical Dictionary, the term anastomosis means an "operative union of two hollow structures." While this definition does not apply to the union of solid structures such as nerves, it is also true that the definition of medical terms can change over time.

Table 1 represents a search covering the last three decades from Medline; the results reveal the use of medical terminology relevant to this discussion. The key words shown in the table were searched in both titles and abstracts from the literature. There are 4988 articles concerning the facial nerve. Of these, only eight papers use the term "neurorrhaphy" which Menovsky and Overbeeke have suggested as the appropriate term for nerve repair by means of sutures. They have also argued that the terms that appropriately describe the entire process are "repair," "reconstruction," or "reconnection." As can be seen in the table, the term "reconnection" has been used in only one paper in 30 years.

In contrast, the term "anastomosis" appears in 155 papers concerning the facial nerve, 113 of which were written in English and 92 of which were human studies. The term "repair" appears in 134 papers concerning the facial nerve, 108 of which were written in English and 78 of which were human studies. The term "reconstruction" appears in 114 papers concerning the facial nerve, 79 of which were written in English and 75 of which were human studies. Twenty-four of the 108 papers using the term "repair" also used the term "anastomosis" for the surgical procedure and nine of the 79 papers using the term "reconstruction" also included the term "anastomosis." "Anastomosis" may be the most popular term for facial nerve surgery among surgeons during this period. "Repair" is likely to have been used more broadly than "anastomosis."

It is important to be as precise as possible in using correct terminology; however, once a term such as "anastomosis" has been adopted, it may be too difficult to eliminate its use. We may have to accept the use of the medical term "anastomosis" to indicate the operative union of two "solid" structures such as nerves.

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References

1. Arai H, Sato K, Yanai A: Hemihypoglossal-facial nerve anastomosis in treating unilateral facial palsy after acoustic neuroma resection. *J Neurosurg* 82:51-54, 1995
2. Cusimano MD, Sekhar L: Partial hypoglossal to facial nerve anastomosis for reinnervation of the paralyzed face in patients with lower cranial nerve palsies: technical note. *Neurosurgery* 35:532-534, 1994
3. Hitselberger WE: Comment on Sawamura Y, Abe H: Hypoglossal-facial nerve side-to-end anastomosis for preservation of hypoglossal function: results of delayed treatment with a new technique. *Neurosurg Focus* 1 (2):Article 3, 1996