Microvascular Decompression in the Management of Glossopharyngeal Neuralgia: Analysis of 217 Cases

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OBJECTIVE: Glossopharyngeal neuralgia (GPN) is a rare condition that often presents with the seemingly benign symptom of deep throat pain. Medical management of this condition has not been very effective, and surgical therapy has ranged from nerve sectioning to microvascular decompression (MVD). We present our experience with more than 200 patients who underwent MVD for treatment of GPN at our institution.

METHODS: We conducted a retrospective review of our database and identified patients who presented for treatment of presumed GPN. When possible, patients were contacted by telephone for collection of follow-up information regarding symptom relief, complications, functional outcomes, and patient satisfaction. Univariate and multivariate analyses were performed to identify predictors of good outcomes after MVD. Subgroup analyses were performed with quartiles of approximately 50 patients each, for assessment of the effects of improvements in techniques and anesthesia during this 20-year period.

RESULTS: We observed GPN to be more common among female (66.8%) than male (33.2%) patients, with an overall mean patient age of 50.2 years (standard deviation, 14.4 yr). The most common presenting symptoms were throat and ear pain and throat pain alone, and the mean duration of symptoms was 5.7 years (standard deviation, 5.8 yr; range, 1–32 yr). Symptoms appeared almost equally on the left side (54.8%) and the right side (45.2%). The overall immediate success rate exceeded 90%, and long-term patient outcomes and satisfaction were best for the typical GPN group (with pain restricted to the throat and palate). Complication rates decreased across quartiles for all categories evaluated.

CONCLUSION: MVD is a safe, effective form of therapy for GPN. It may be most beneficial for patients with typical GPN, especially when symptoms are restricted to deep throat pain only. (Neurosurgery 50:705–711, 2002)

Key words: Glossopharyngeal neuralgia, Microvascular decompression

The term glossopharyngeal neuralgia (GPN) was introduced into medicine only relatively recently, having been first proposed by Harris in 1921 (6) and then used by Doyle (3) in 1923, when he described four patients with GPN. Its diagnosis has changed little from a 1927 description by Dandy (2) as paroxysmal pain frequently brought on by eating and swallowing with involvement of the root of the tongue and pharynx with radiation to the throat and/or deep ear structures. However, the relative rarity of this condition has made its recognition difficult, often resulting in significant delays to diagnosis. After GPN has been established, various treatment modalities (both medical and surgical) can be used. Since the original account of sectioning of the IXth cranial nerve and the upper rootlets of the Xth cranial nerve was reported by Sicard and Robineau (13), multiple variations of intracranial, cervical, and pharyngeal approaches for destruction of these nerves, as well as of ascending sensory tracts, have been described. At our institution, we use nonablative procedures to preserve these neural structures, and we thus treat GPN with microvascular decompression (MVD) of Cranial Nerve IX. To determine short- and long-term outcomes, as well as to identify predictors of success, we undertook a retrospective review of data for all patients in our database who underwent MVD for treatment of GPN. We also sought to examine changes in complication rates with time, via quartile analysis.

PATIENTS AND METHODS

Our computer database of patients who underwent MVD between 1973 and 2000 was reviewed for patients with a

TABLE 1. Study Population

	1973–1987	1988–1992	1993–1995	1996–2000	Total
No. of patients	52	49	48	68	217
Age (yr)[a]	50.6 ± 14.7	53.3 ± 13.2	48.0 ± 15.1	49.3 ± 14.5	50.2 ± 14.4
Male (%)	28.8	26.5	37.5	38.2	33.2
Surgery on left side (%)	59.6	53.1	52.1	54.4	54.8
Duration of symptoms (yr)[a]	5.0 ± 4.7	6.2 ± 6.8	6.0 ± 5.7	5.8 ± 5.9	5.7 ± 5.8

[a] **Mean ± standard deviation.**

primary diagnosis of GPN. Two hundred seventeen patients were identified. They were divided into quartiles of approximately 50 patients each, with breaks planned to coincide with the beginning of a calendar year. The database information included immediate relief data for all patients but included incomplete long-term follow-up data; therefore, a telephone survey was performed to collect long-term data. Outcomes were measured by using the original continuous pain scale of 0 to 10 with which patients were first asked to rate their pain. A score of 10 was equivalent to the worst pain ever experienced by a patient, whereas a score of 0 indicated no pain. For patients to be considered as having obtained "complete relief," they were required to have no pain (score of 0) and to have ceased receiving any preoperative medications. "Partial relief" was defined as a minimum of a 4-point improvement on the continuous pain scale, with or without medications (e.g., preoperative score of 10 to postoperative score of ≤6 or preoperative score of 9 to postoperative score of ≤5). Patients who obtained improvement of less than 4 points on the pain scale (deemed insignificant partial relief) and those with no improvement on the pain scale were considered to have experienced treatment failure.

The details of our study population as a whole and according to quartile are presented in *Table 1*. Our patients were predominantly female (66.8% women versus 33.2% men), with a mean age of 50.2 years (standard deviation, 14.4 yr). Cases were nearly evenly divided between right and left sides (54.8% left side versus 45.2% right side). It is interesting to note that accumulation of the first quartile (n = 52) required 15 years but that of the second quartile (n = 49) required only 5 years and that of the third quartile (n = 48) required only 3 years. The remaining patients were all grouped into the fourth quartile, which thus contained 68 patients accumulated in 5 years. Also of note is the fairly long mean duration of symptoms for these patients before they presented to a neurosurgeon (5.7 yr; standard deviation, 5.8 yr; range, 1–32 yr), again underscoring the difficulty of diagnosing this rare condition. In comparisons across quartiles, patients were not significantly different with respect to age, sex, side of surgery, or duration of symptoms ($P > 0.05$). Presenting symptoms for patients according to quartile are presented in *Figure 1*. It should be noted that the majority of patients in all quartiles presented with throat and ear pain in combination.

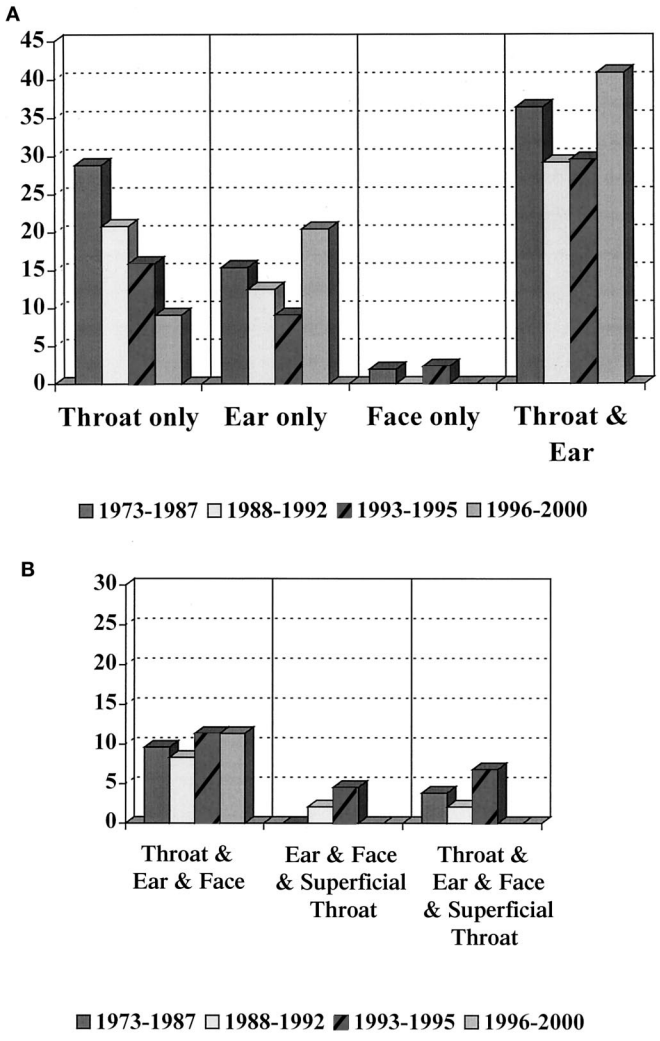

FIGURE 1. Presenting symptoms (all patients).

RESULTS

Immediate results

The rates of immediate complete success, partial success, and failure (as defined above) are presented in *Figure 2* for all 217 patients, as well as for patients according to quartile. MVD for the treatment of GPN afforded complete immediate

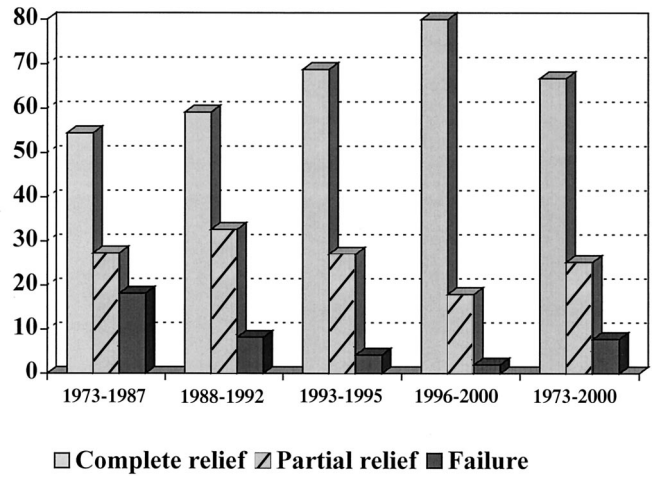

FIGURE 2. Immediate relief (217 patients).

relief for 67% of all patients who surgically treated between 1973 and 2000. An additional 25% obtained partial relief, yielding a total immediate success rate of 92%, whereas 8% of patients experienced no significant changes in symptoms after surgery. For purposes of analysis, the quartile rates of relief presented in *Figure 2* were regrouped into two categories, i.e., cure (complete relief) or no cure (partial or no relief), in *Figure 3*. There it can be noted that more patients were in the category representing complete relief and fewer in the partial or no relief category when remote quartiles were compared with recent ones. This divergence with time, with more patients achieving surgical cures, reached statistical significance ($P = 0.04$).

Long-term results

To explore this apparent improvement in patient cures with time, we attempted to identify predictors of long-term success. We first contacted patients for long-term follow-up data, beginning with those in the most recent quartile and progressing to earlier time periods. Because of many difficulties in locating patients, we were able to reach only 30 patients from the most recent quartile, 15 from the second most recent quartile, 5 from the third most recent quartile, and none from the most remote quartile, for a total of 50 patients. The long-term follow-up data amounted to 208 patient-years, with a mean follow-up period of 48.8 months (4 years) and a median follow-up period of 42.5 months (range, 3.5–128 mo). When immediate relief rates for only these 50 patients were analyzed, complete relief was observed for 64%, partial relief for 26%, and no relief for 10% (*Fig. 4*). These immediate relief rates are strikingly similar to the immediate relief rates observed for our total population of 217 patients (67, 25, and 8%, respectively) (*Fig. 2*). These findings seem to support the assumption that the patients we were able to contact were representative of the group as a whole. Long-term relief, as assessed by direct communication with patients, was noted to be complete for 58% of patients and partial for 18%, yielding a total long-term success rate of 76%. Long-term failure (results ranging from improvement of less than 4 points on the pain scale to frank failure) was observed for the remaining 24% of patients (*Fig. 5*).

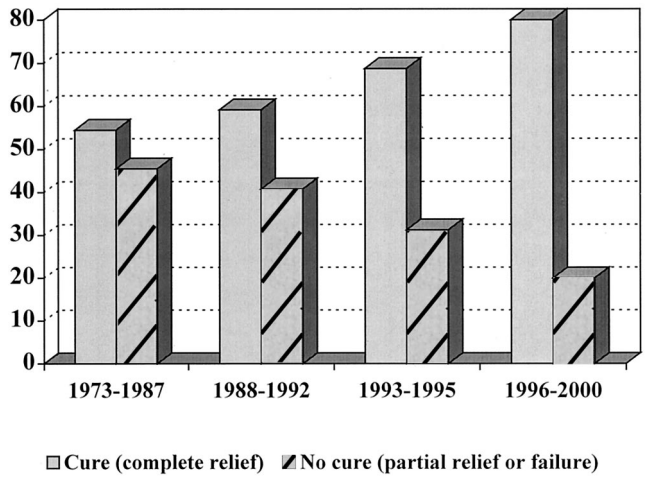

FIGURE 3. Immediate relief (217 patients).

Predictors of success

Univariate and multivariate analyses were performed on presenting symptoms and symptom combinations for these 50 patients, to determine whether any predictors of successful outcomes of MVD could be identified. For these analyses, we used a stricter criterion for success, defining it only as complete relief (i.e., no pain, without medications). Partial relief, even when significant (as evidenced by a >4-point improvement on the pain scale), was not considered a success for these analyses. These results are presented in *Figures 6 to 8*. *Figure 6* presents the likelihood of achieving complete relief after MVD given the presence of the indicated symptoms. Although patients may have exhibited more than one of these symptoms, *Figure 6* demonstrates the likelihood of cure if at least that particular symptom was present. Therefore, if the patient experienced tongue pain ("yes" bar in the tongue pain category), whether or not any additional symptom was present, he or she had a 50% likelihood of cure. If the patient did not have tongue pain as a part of the symptom complex, he or she

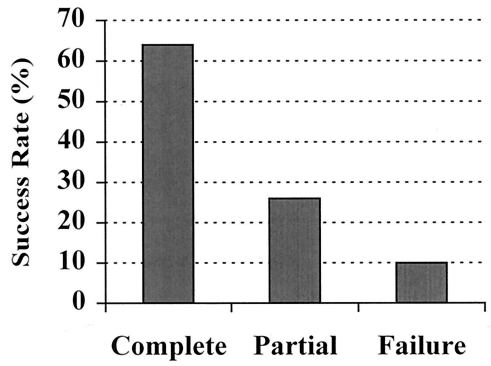

FIGURE 4. Immediate relief (50 patients with long-term follow-up data).

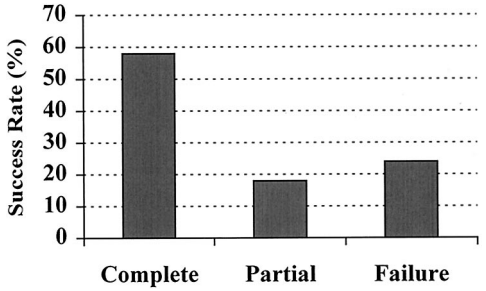

FIGURE 5. Long-term relief (50 patients).

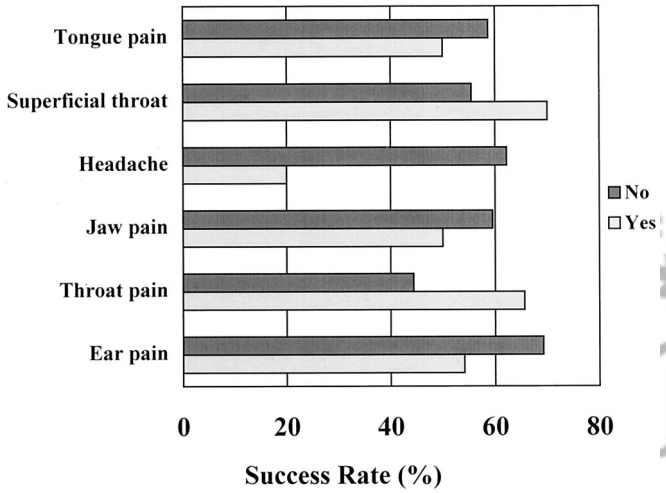

FIGURE 6. Long-term cures according to symptom presence.

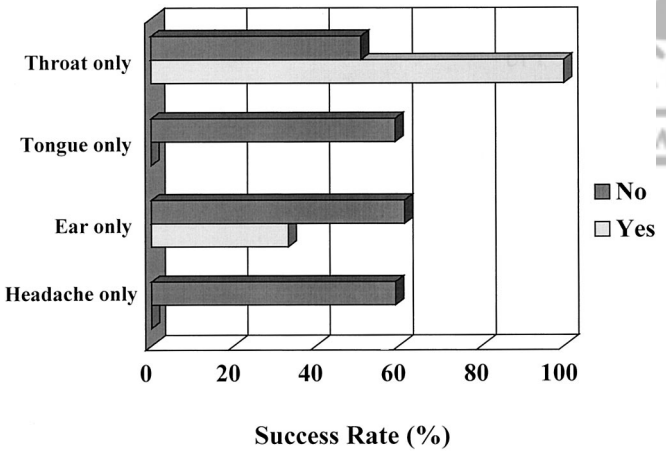

FIGURE 7. Long-term cures according to the presence of single symptoms only.

had an almost 60% likelihood of cure ("no" bar in the tongue pain category). Similarly, the cure rate was 65% with the presence of throat pain ("yes" bar in the throat pain category) and 45% with no throat pain ("no" bar in this category). The presence of any one of the symptoms listed in *Figure 6* ("yes" bar in each category) demonstrated a likelihood of cure, independent of the presence or absence of any of the other

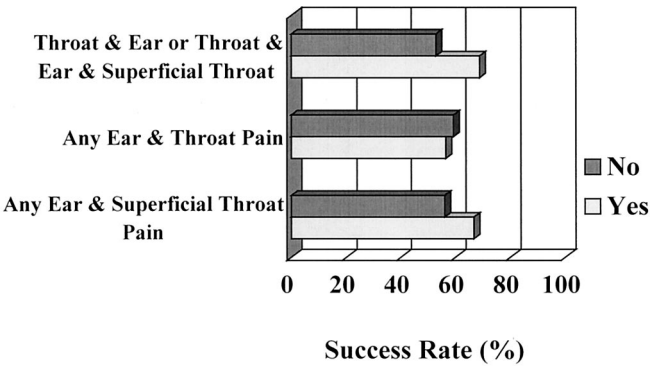

FIGURE 8. Long-term cures according to combinations of symptoms.

symptoms listed, of 50 to 66% (values in agreement with our long-term complete cure rate of 58%), with one notable exception, i.e., headache. If a patient presented with headache as a prominent component of his or her symptoms, then he or she had only a 20% likelihood of cure, even when more typical symptoms (such as throat or ear pain) were also present. When the "yes" (symptom present) and "no" (symptom not present) groups were compared within each symptom category for statistical significance, all P values were observed to be >0.1 and were thus not significant. Therefore, on the basis of these data, we are currently unable to tell our patients that, if they have at least a particular symptom, they are more likely to achieve cure of GPN through MVD.

The analysis presented in *Figure 7* attempts to control for possible multifactorial causes by defining a subset of patients with single-symptom complaints only, thus eliminating potential confounding symptoms. It can be hypothesized that perhaps these patients have a more purely biological form of the disease that is more likely to be amenable to surgical therapy. Indeed, 100% of patients who presented with isolated throat pain obtained complete relief after MVD, a value that did reach statistical significance ($P < 0.05$) when compared with the 51% of patients who did not have isolated throat pain only but obtained relief after surgery. Although this may seem to be a high percentage, it should be recalled that this "no" group included some patients who experienced throat pain but in combination with other symptoms, rather than in isolation. Although both the tongue pain-only and headache-only groups demonstrated no patients achieving complete relief, the numbers of patients in those groups were too small for statistical significance.

Finally, *Figure 8* presents results for patients with the combinations of symptoms listed. Patients in the first group, with throat pain with or without a superficial component as well as ear pain, exhibited a 69% chance of complete long-term cure after MVD. When the combination of any ear and throat pain was considered (the second group), allowing patients to exhibit additional confounding symptoms, the likelihood of long-term cure decreased to 56%; patients without either symptom were slightly more likely to achieve cures (59%). Again, none of these comparisons reached statistical significance, with all P values remaining greater than 0.1.

Complications

The percentages of patients with specific complications in each time period are presented in *Table 2*. Significant decreases in intracranial hematoma and operative mortality rates were observed across quartiles from remote to most recent ($P < 0.05$). These decreases are likely the result of both increased surgical experience and better operative and postoperative patient care. Our rates of cerebrospinal fluid leaks and postoperative cranial nerve palsies decreased across quartiles, and these complications are now observed for less than 2% and less than 3% of patients, respectively.

DISCUSSION

As mentioned above, treatment modalities for GPN are varied and include both medical and surgical therapies. These numerous therapies may be based on a multifactorial pathogenesis for GPN, including complex environmental, social, and psychological factors, but one putative cause of GPN is thought to be vascular compression. It has long been recognized that vascular compression causes different cranial neuropathies that manifest as pain syndromes. Early operative results were reported by Taarnhøj (15) and Gardner and Miklos (4) for decompression of Cranial Nerve V for the treatment of trigeminal neuralgia, as well as by Gardner and Sava (5) for decompression of Cranial Nerve VII for the treatment of hemifacial spasm. GPN was proposed as a vascular compression syndrome in observations by Brihaye et al. (1), who described a postmortem atheromatous vertebral artery causing compression of lower cranial nerves in a 77-year-old woman with GPN, and by Kempe and Smith (7), who noted that a persistent hypoglossal artery compressing the nerve could also cause GPN. MVD as a feasible treatment modality for this disease was described by Laha and Jannetta (9) in 1977. In that report, three of six treated patients underwent MVD alone, with one of those three obtaining complete relief and another obtaining partial relief.

Despite this pathogenesis, most surgical treatments have focused on destructive procedures, aimed at rhizotomy of Cranial Nerve IX and part of Cranial Nerve X. Indeed, in the report by Rushton et al. (12) describing their results for 129 patients (the largest surgical series reported to date), it was noted that all patients were treated with sectioning of the glossopharyngeal nerve, sometimes in combination with other cranial rhizotomies. Those authors observed good results (the term "good" was not defined) for 85% of their patients but did not report the follow-up interval (12). Although these destructive procedures may serve a subset of this population well, we advocate using nonablative procedures such as MVD whenever possible, to preserve normal neural structures.

Studies that examined the results of MVD for the treatment of GPN were smaller and included 16 patients evaluated by Wakiya et al. (16). In 1 month to 4 years of follow-up monitoring, those authors observed complete relief of pain for 15 of 16 patients (94%), with the other patient experiencing partial relief. A number of even smaller series demonstrated 100% relief after MVD, including reports by Sindou et al. (14) of 9 patients, by Olds et al. (10) of 3 patients, and, most recently, by Kondo (8) of 16 patients, with a minimal follow-up period of 5 years. The largest previous series of MVD treatments for GPN was from this institution; Resnick et al. (11) observed excellent long-term results (complete or >95% pain reduction without medication) for 76% of the 40 patients they studied, with substantial improvement for an additional 16%.

Our analysis of 217 patients who underwent MVD treatments for GPN demonstrates that MVD is an effective treatment modality, with a low complication rate. Complete or significant partial pain relief was experienced immediately by 90% of the 217 treated patients and in the long term by 75% of the patients for whom follow-up data were available. Complete relief without medication was observed immediately for 67% of the patients and in the long term for 58% of the patients. This procedure seems to be most efficacious for patients who present with isolated throat pain only.

ACKNOWLEDGMENTS

We acknowledge Dr. Peter Jannetta and Dr. Hae Dong Jho, who treated or supervised many cases between 1973 and 1999. We also thank Amy McKinnon, who made numerous telephone calls to obtain long-term follow-up data.

TABLE 2. Complication Rates

	Rate (%)			
	1973–1987	1988–1992	1993–1995	1996–2000
Intracranial hematoma[a]	5.8	0	0	0
Brainstem infarction	0	4.1	0	0
IXth/Xth cranial nerve palsy	9.6	4.1	4.2	2.9
VIIIth and other cranial nerve palsy	0	2	4.2	1.5
Cerebrospinal fluid leak	5.8	2	2.1	1.5
Operative death[a]	5.8	0	0	0
Dysphagia	0	0	4.2	0

[a] $P < 0.05$.

Received, March 21, 2001.
Accepted, November 13, 2001.
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COMMENTS

The rarity of glossopharyngeal neuralgia (GPN) has precluded the accumulation of significant surgical experience at most institutions. The authors carefully analyzed the results of microvascular decompression (MVD) for treatment of GPN in this retrospective review of 217 patients who were treated at one institution between 1973 and 2000. Forty of the patients included in this study were previously described. This report represents by far the largest surgical series of patients with GPN. This analysis provides significant information regarding the epidemiological features of GPN, the immediate results of MVD, and the clinical features that predict favorable responses to MVD. Analysis of the long-term benefits of MVD was hampered by the lack of long-term follow-up data for the overwhelming majority of patients. The 50 patients for whom long-term follow-up data were obtained, however, seemed to exhibit demographic features and initial responses to surgery similar to those of the entire group.

The authors demonstrated that the majority of patients with GPN were female (66.8%), with a mean age at presentation of 50 years. The long mean duration of symptoms (5.7 years) was likely attributable to misdiagnoses related to the rarity of this condition. This study demonstrated initial good results of MVD for 92% of patients. Sixty-seven percent of patients experienced immediate complete relief of their pain and another 25% experienced partial relief. Only 8% of patients obtained no benefit from the procedure. It is interesting to note that the results of surgical treatment improved during the period of time in which the study was conducted, with the best surgical results and fewest complications occurring among the most recently treated patients. The authors attribute these improvements to multiple factors, including better diagnosis and patient selection, improved technical skills, increased experience, and better perioperative management. In analyses of a variety of presenting symptoms, it was clear that the best surgical candidates were patients with isolated throat pain, a group in which 100% of the patients obtained complete relief after MVD.

Unfortunately, long-term follow-up data could be obtained for only 50 of the 217 patients. Their demographic and clinical features were similar to those of the total group, however, and the immediate results were nearly identical to those for the larger series. This suggests that the 50 patients for whom long-term follow-up data were available were representative of the entire group.

This analysis adds significantly to our understanding of the demographic and clinical features of GPN and the response of this condition to MVD. This should be extremely helpful to clinicians in the selection of patients to undergo MVD for treatment of GPN.

Daniel L. Barrow
Atlanta, Georgia

This is an important report of a series of patients with GPN, which should encourage the medical community to provide these patients with the benefits of MVD procedures, at an earlier stage. Many of these patients suffered for a long time (an average of 6 yr) before being referred to a neurosurgical center. The results reported by the authors prove that MVD is effective in the long term for pure Cranial Nerve IX/X (vagoglossopharyngeal) neuralgias. Furthermore, in contrast to trigeminal neuralgia, there is no good alternative for these patients.

A weak point of this article is that the anatomic and technical causes of failure are not reported. A strong point is that the authors' study clearly demonstrates that surgical experience (with its "learning curve") plays a major role, not only

for obtaining better successes with respect to pain relief (*Fig. 3*) but also for avoiding complications (*Table 2*).

Marc Sindou
Lyon, France

This study reports follow-up results for the largest group of patients treated for GPN with MVD at a single institution with long-term experience in the treatment of neuralgias with MVD. The article provides useful demographic data regarding the sex distribution, lesion laterality, and ages of affected patients. Interestingly, the presenting symptom of isolated throat pain was associated with the highest rate of success after the MVD procedures. However, with a mean follow-up period of 4 years, the authors noted a failure rate of 42%, which is significant. It is also worth noting that only 20 of the 217 patients were monitored for more than 4 years.

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Pollock, 1949. Photograph by Arnold Newman.