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Delays in the Diagnosis of Acoustic Neuromas

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Summary: From the medical files of 164 consecutive patients who underwent surgical treatment for a unilateral acoustic neuroma between 1980 and 1992, we collected data on the delay until the diagnosis was made. A distinction was made between the patient's and general practitioner's delay (delay 1) and the delay after the specialist's first visit until the radiologic diagnosis (delay 2). The average delay was 35.7 months (SD, 62.2) for delay 1 and 15.2 months (SD, 36.3) for delay 2. Specialist's delay (otolaryngologist or neurologist) was divided into a delay of a maximum of 12 months (134 patients) and a longer delay (30 patients). In 27 of the 30 patients, no specific tests had been performed, and in the remaining three, the test results were inconclusive. Reasons for not conducting further tests included familial hearing impairment, Meniere's disease, otosclerosis, and alcoholism. In cases in which the specialist had not made the diagnosis within 1 year, it took an average of 6 months extra to make the diagnosis of an acoustic neuroma, usually with a fairly short patient delay. The specialist's delay remained constant in the period of investigation, with the possibility of magnetic resonance imaging (MRI) scanning only in the last 2 years. In view of the increasing accessibility of MRI, it is now recommended if possible to perform MRIs in all patients with symptoms suspicious for an acoustic neuroma. **Key Words:** Diagnostic delay—Diagnosis—Acoustic neuroma.
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Making a diagnosis will unavoidably take time. In some cases, it will take longer than others. For instance, making the diagnosis of an acoustic neuroma can be difficult. The most common initial symptoms include unilateral deafness and tinnitus. In the majority of cases, there will be an alternative explanation for these symptoms, which is why a patient's delay and a doctor's delay can arise. If an acoustic neuroma is suspected, performing the necessary specific tests can also lead to delay, owing to a waiting interval, limited accessibility, and limited capacity of the testing facilities. In the literature, authors have seldom mentioned the time it took to make the diagnosis. Exceptions were the reports by Thomsen and Tos (1) and Traquina et al. (2), in which these delays were mentioned for the two series of patients.

This study was performed to investigate the various forms of delay that occurred in a series of patients who were operated on at the University Hospital Nijmegen between 1980 and 1992. Over time, diagnostic imaging techniques have changed and improved. During the whole study period, auditory brainstem response (ABR) examination and computed tomography (CT) scanning were available. In the initial period of the study around 1980, dilation of the internal acoustic meatus was examined radiologically, mostly using Stenver's view. When the successive generations of CT scanners became available, first using oil and later using air in the intrathecal sac to give contrast to the porous internal acoustic canal, this was the examination method of choice. In recent years, magnetic resonance imaging (MRI) has become the gold standard; tumors with a diameter of only a few millimeters can be detected. The average diagnosis time can be expected to decrease.

MATERIALS AND METHODS

In the period from 1980 to 1992, 164 patients underwent surgical treatment for a unilateral acoustic neuroma at the University Hospital Nijmegen. The patient's medical files were reviewed to obtain data on the time it took to arrive at the final diagnosis. In the Netherlands, patients with any types of symptoms or complaints are first seen by their general practitioners (GPs). The GP decides whether the patient should be referred to a specialist (otolaryngologist or neurologist) on the grounds of his or her symptoms. The period until the patients saw the specialist was called delay 1 in this study (patient's or GP's delay). Some patients in the Netherlands, depending on their health insurance, can also go directly to a specialist without having to see their GPs first.

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The patient is then examined by a specialist, and sooner or later, he or she will make the diagnosis of an acoustic neuroma, and he or she will send the patient to a surgeon. This is referred to as delay 2 (specialist delay). The date on which an acoustic neuroma was diagnosed radiologically was taken as the date of diagnosis. CT scanning first became available at our hospital in 1978; MRI became available in 1991, but initially, accessibility was extremely limited quantitatively. In only a minority of the patients in 1991 and 1992 was an MRI scan made. Delay is expressed in months in this study.

RESULTS

The average delay was 35.7 months (SD, 62.2; range, 0 to 468 months) for delay 1 and 15.2 months (SD, 36.3; range, 0 to 242 months) for delay 2. The time necessary to make the diagnosis remained fairly constant over the 13-year study period (Fig. 1), and no significant shift in the delay was found ($n = 164$; $r = -0.038$; $p > 0.40$).

The average diameter of the tumors gradually decreased from 33 mm in 1980 to 22 mm in 1992 ($n = 164$; $r = -0.279$; $p < 0.000\,34$; Fig. 2). In a group of 30 patients of the original 164, delay 2 was >12 months. We investigated the reasons for this. In 27 of them, no specific tests had been performed for pathology in the cerebellopontine angle, despite the fact that the symptoms were indicative of this. The complaints comprised asymmetrical perceptive hearing loss of ≥20 dB ($n = 28$), vertigo and tinnitus ($n = 18$), otalgia ($n = 4$), ataxia ($n = 2$), and headaches ($n = 1$). In three patients, the radiographs of the os petrosum (Stenver's view) were normal ($n = 2$ in 1980) or the ECOG/BER test was normal ($n = 1$ in 1989). Reasons that no further tests had been carried out were mentioned in some of the patients' files. These included familial hearing impairment, Meniere's disease, otosclerosis, and alcoholism. The diagnosis was made at a later date because of deterioration of the complaints or new symptoms (Table 1). The ultimate duration (delay 1 and 2) until the radiologic diagnosis was made was an average of 51.2 months (SD, 74.1; range, 0 to 505 months). In the 134 patients for whom the specialist's delay was <12 months, the total delay was an average of 39.1 months (SD, 61.6), whereas in the 30 patients for whom the specialist's delay was >12 months, it was 97.6 months (SD, 98.9). Delay 1 (patient or GP) was >12 months (average, 50.6 months; SD, 57.6) in nine of the 30 patients and <12 months in the remaining 21.

Table 2 shows the length of delay 1 or 2 per tumor size. Although the differences were not significant because of the large standard deviation, there was a visible trend that as the tumor diameter increased, delay 1 and 2 also increased from 67.4 months to 90.5 months. There was no correlation between delay 2 (specialist's delay) and the tumor size (Fig. 3). In almost all cases, the first (general) specialist who was referred to also finally made the diagnosis and sent the patient to the surgeon. In the period of investigation, CT scanning was constantly available. There was no influence found on the delay from the MRI scan. This technique was only (to a limited extent) available in the last 2 years, and in this period, only in a minority of patients could an MRI scan be made.

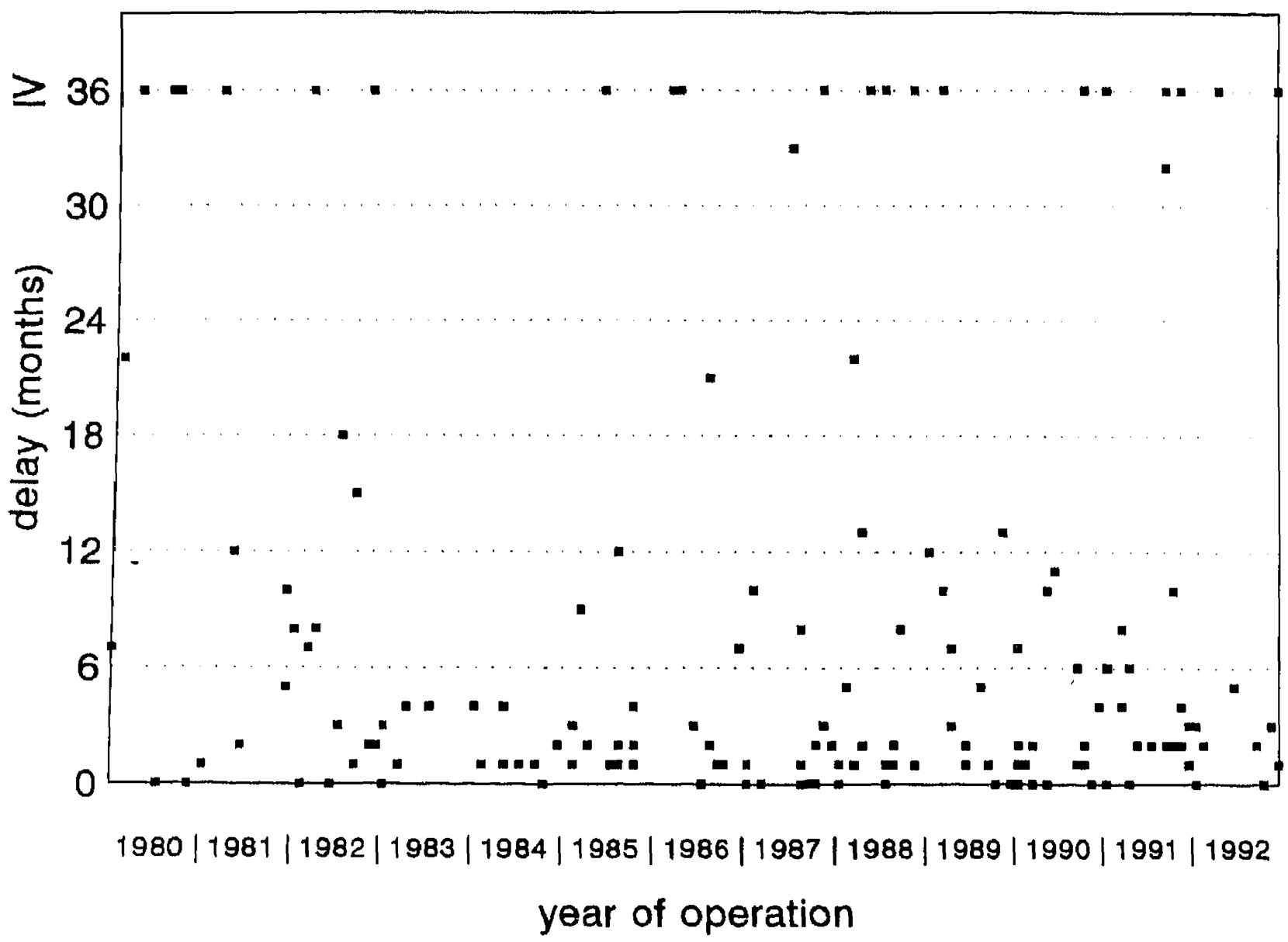

FIG. 1. Mean tumor size and standard deviation per year.

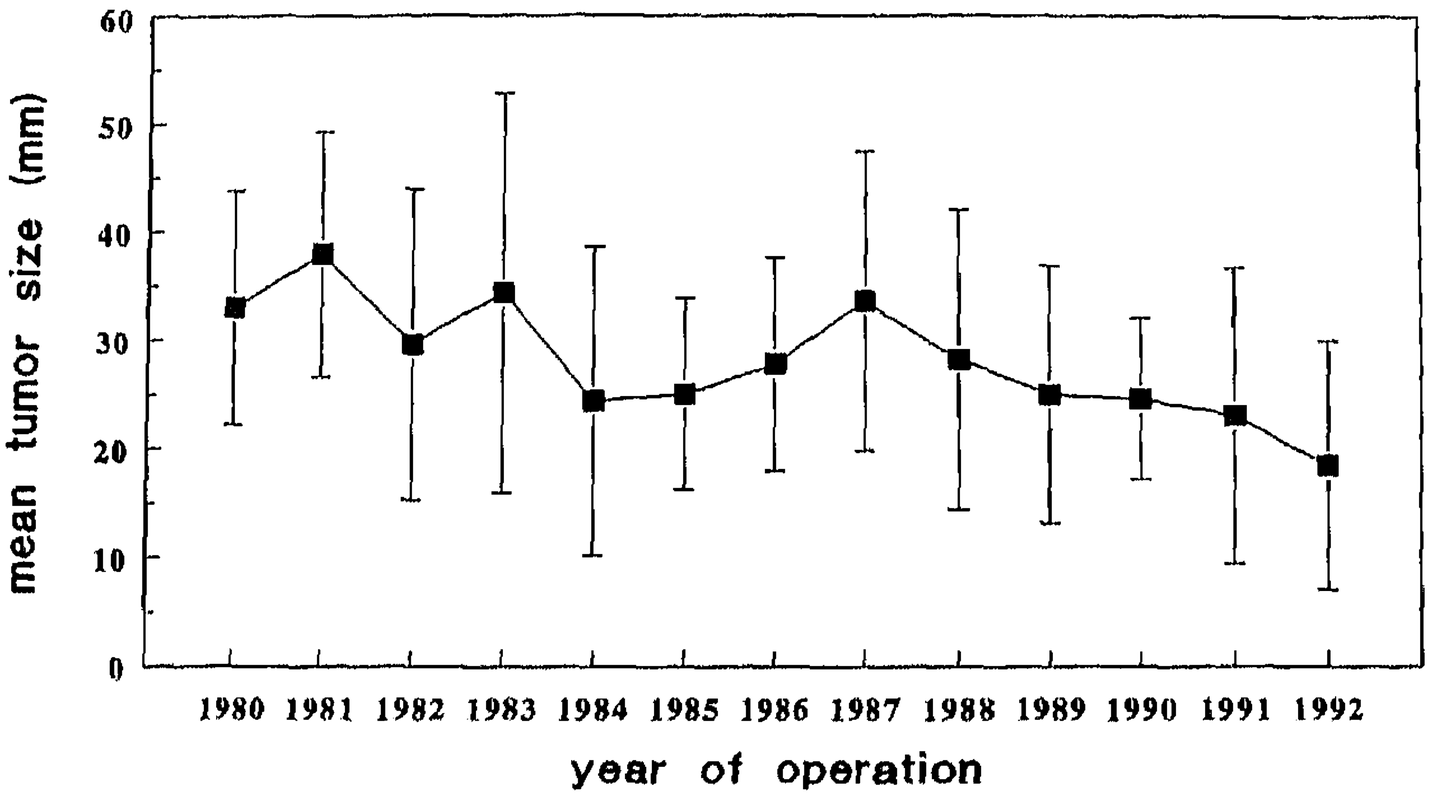

FIG. 2. Specialist delay between 1980 and 1992.

DISCUSSION

Delay is a sensitive issue in medical practice because of possible reproach and liability. It would be rash to speak in terms of a reprehensible medical error. "Duration" is a more neutral word. However, it is not our intention to pass judgment about various types of delay. Nevertheless, it was interesting to examine in practice how much time elapsed before the diagnosis of an acoustic neuroma was made and to distinguish between various reasons for delay.

Nowadays the diagnosis is made at a much earlier stage. In the past, symptoms of gross neurologic impairment were generally necessary to give rise to the suspicion of cerebellopontine-angle pathology. Thanks to audiometry and particularly ABR examination, diagnosing retrocochlear pathology became much more efficient in the 1970s. Revolutionary developments in radiodiagnostics have led to MRI's replacing CT scanning as the gold standard. The average tumor size decreased considerably in our patient series because of these improvements (Fig. 2), which is in agreement with reports on other series (3).

Little attention has been paid to the time involved in present-day diagnosis, but this is becoming steadily more topical in legal proceedings. In the literature, this subject has been all but ignored. Thomsen and Tos (1) referred to a period of 1 year after referral as a situation with no diagnostic delay. They considered a longer duration to represent delay. After reviewing their series, they found "delay" in 233 (78%) of the 300 patients seen between 1976 and 1985. In our Dutch study, the specialist had made the diagnosis within 1 year after referral in 134 (82%) of the 164 patients. The total duration (delay 1 and 2) from the presenting symptom until radiologic diagnosis was generally much longer. In this study, delay 1 and 2 was >1 year in 70% of the patients; thus the diagnosis was made within 1 year in only 30% of the patients. Traquina et al. (2) found a similar delay (delay 1 and 2) of >1 year after the presenting symptom in 19 (76%) of the 26 patients seen from 1980 to 1987. The total duration until diagnosis in their study was 51 months, which is in close agreement with the 51.2 months in our study. The total average duration in the study by Thomsen and Tos (1) was 85 months. Levine et al. (3) mentioned the duration of symptoms (29 months) but not the delay until diagnosis. Selesnick et al. (4) distinguished only between different delays per symptom. The average duration of, for example, hearing loss, tinnitus, and vertigo symptoms before diagnosis was between 41 and 47 months. It is noteworthy that in the Nijmegen series, no correlation was found between the specialist's delay and tumor size (Fig. 3). One explanation for this is the slow growth rate typical of an acoustic neuroma. Earlier, no correlation was re-

TABLE 1. *Reason for further investigation*

	No.of patients
Deterioration of hearing impairment	11
Ataxia	7
Headache	6
Otalgia	3
Deterioration of vertigo	3
Walking problems	3
Trigeminal signs	3

TABLE 2. *Diagnostic delay and tumor size*

Tumor size	Patients (no.)	Delay 1 (mo)	Delay 2 (mo)	Delays 1 + 2 (mo)
1–25 mm	87	27.2 (SD 49.3)	16.1 (SD 36.1)	43.2 (SD 67.4)
26–40 mm	60	46.1 (SD 76.6)	9.1 (SD 19.7)	54.6 (SD 76.9)
>40 mm	17	44.5 (SD 60.2)	32.4 (SD 65.4)	76.8 (SD 90.5)

Delay 1, the patient's and general practioner's delay; delay 2, the specialist's delay; delay 1 + 2, the time until an acoustic neuroma was diagnosed.

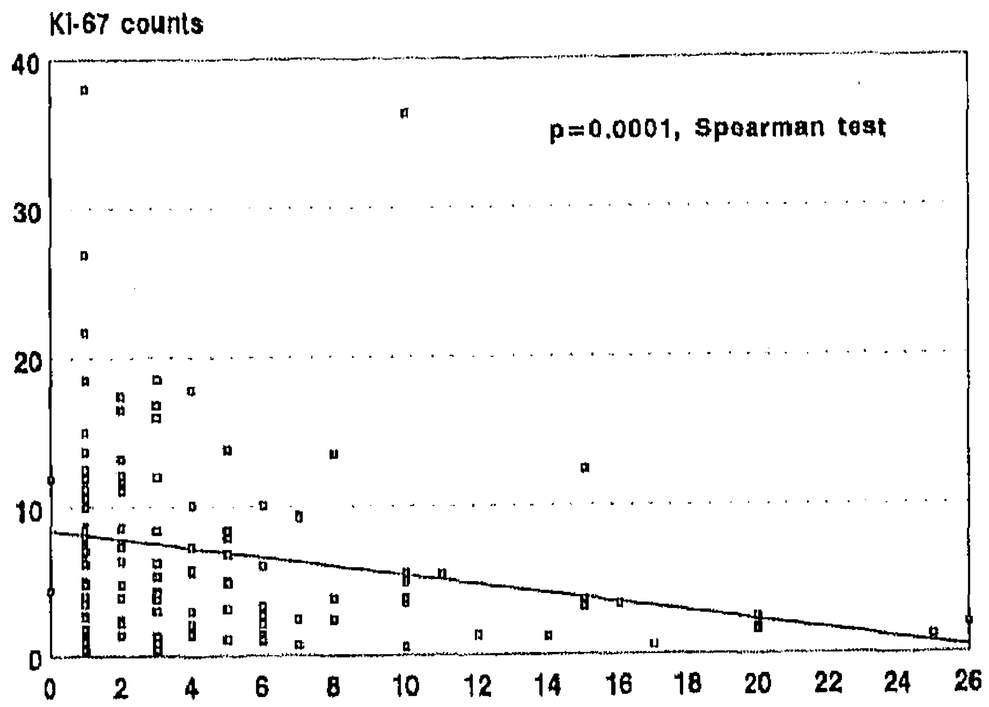

FIG. 3. Tumor size and specialist delay.

ported between the level of hearing impairment, the age of the patient, and the tumor diameter (5).

Not only the small tumors go undetected by the specialist. Long delay does not necessarily lead to an exceptionally large tumor. In this series, we observed only a trend that the larger the tumor, the longer the diagnostic delay. Combinations of symptoms that mask the presence of an acoustic neuroma have been described occasionally. Clemis et al. (6) mentioned that otosclerosis was the masking symptom in 15 of their own patients; they also found similar reports in the literature. It is always worth considering whether a long-term symptom such as hearing loss, which ultimately signifies the presence of cerebellopontine-angle pathology, could have had a different cause at an earlier stage. We know that in recent years, an acoustic neuroma of a few millimeters diameter can be detected with MRI and that this sometimes occurs in patients who have had an asymmetrical hearing loss for ~15 years. Therefore it is justified to doubt whether there is always really a causal relation between long-term hearing loss and the much later diagnosis of an acoustic neuroma.

The average specialist's delay remained more or less constant, and in 30 of the 164 patients, it was >1 year. In 27 of these cases, no adequate diagnostic tests had been carried out, and in the remaining three cases, the tests themselves had been inadequate. The cause of longer delays can be attributed mainly to incorrect interpretation of the symptoms by the specialist and not to technical failure. If the diagnosis is not made within 1 year of referral to a specialist, it usually takes far longer for the diagnosis to be made (39.1 months versus 97.6 months). If cerebellopontine-angle pathology is not suspected initially, or has been excluded, this diagnosis is subsequently ignored for a considerable period. The cause of a long delay is therefore far more often due to misjudgment by the specialist (21 of 30) than to patient or GP delay (nine of 30).

Despite the enormous improvements in diagnostic techniques, recent experience has shown that there are still considerably long delays in diagnosis. The improvements of CT-scanning technique did not influence the delay time. It may becoming easier to avoid this situation because of more accessible MRI. MRI of the cerebellopontine angle offers the opportunity to exclude an acoustic neuroma. Future investigations of delays may prove the expected positive influence of more extensive MRI scanning of patients at risk for an acoustic tumor. The average duration until the first consultation with the specialist (delay 1) is more than twice as long as the time necessary to make the diagnosis (delay 2). Greater public awareness of the symptoms—and GP awareness—can also shorten this first delay. Once the diagnosis had been made, the patients did not have to wait long for surgery in our clinic.

CONCLUSION

It is unavoidable that it may take some considerable time to make the diagnosis of an acoustic neuroma. The average duration before the patient was referred to a specialist was 3 years in our series. The average time until this specialist made the diagnosis was slightly >1 year. Although the average diameter of the tumors decreased, the time that it took the specialist to make the diagnosis did not decrease. Performance of an MRI of the cerebellopontine angle is recommended if there is any suspicion of pathology in this region. Even patients with a long-term anamnesis of complaints, such as asymmetrical hearing loss, tinnitus, or vertigo, have the right to undergo MRI to exclude retrocochlear pathology. In some cases, more than one diagnosis may be applicable, seen either simultaneously or at a later date. Our research into the 30 patients in whom the specialist took >1 year to make the diagnosis showed that a retrocochlear tumor is not always suspected. Once a diagnosis has been "excluded," it does not appear to be reconsidered for quite some time. The level of hearing impairment can be one of the deciding factors in the choice between ABR or MRI (7). If there is any doubt, it should be kept in mind that MRI is now the method of excluding cerebellopontine-angle pathology with a great deal of certainty. ABR can help to detect false-positive MRI findings and can be instrumental in interpreting whether the patient has cochlear or retrocochlear hearing loss (8).

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