

Review Articles

Hearing preservation in vestibular schwannoma surgery: fact or fantasy?

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Abstract

This study reviews 57 papers dealing with the issue of hearing preservation in vestibular schwannoma surgery published in otolaryngologic and neurosurgical literature between the years 1977 and 1994. The authors', in this review, have made an attempt to verify whether the claims of hearing preservation are real, whether there is a price to be paid in terms of morbidity and whether there are univocal criteria for reporting results. The review shows that there is a wide disarray in reporting hearing results and the claims of hearing preservation are often unreal and misleading. On retabulating the results of a few series according to the minimal prerequisites for normal hearing (PTA ≤ 30 dB and SDS ≥ 70 per cent) and according to other various commonly reported criteria, it became evident that rates of hearing preservation differed a lot depending upon criteria. While any measurable hearing could be preserved in many cases, only a few had normal hearing preserved.

Key words: Vestibular schwannoma; Hearing disorders; Review literature

Introduction

Vestibular schwannoma surgery in the last few years has improved greatly to attain its present state-of-art. Rapid advances in audio-vestibular diagnostic modalities (ABR) and sophisticated imaging techniques facilitate the earlier detection of acoustic tumours, most of them being yet small and many of them associated with good hearing. When otoneurosurgical procedures are contemplated for such patients in whom good or serviceable pre-operative hearing is at jeopardy, the priorities of total tumour removal, facial nerve integrity and minimal morbidity must be clearly established. Nevertheless, backed by phenomenal advances in surgical techniques and intraoperative cranial nerve monitoring, many of these ranked priorities are being overcome and the attention has diverted to the issue of hearing preservation in acoustic tumour surgery.

Consequently, many articles have appeared dealing with the issue of hearing conservation in vestibular schwannoma literature. While innumerable papers, many of them with high rate of hearing preservation, are presented in various congresses, only few of them are sent for publication (Sanna *et al.*, 1991a). Nevertheless, in an effort to establish the current status and real concept of hearing preservation in acoustic neuroma surgery, we present in brief,

a review of papers published between the years 1977-1994. Although the literature bears many papers, we include principally the articles figuring in English literature. Further, in cases wherein authors have regularly documented their experience only the last updated report was considered for review. Many of the papers excluded here are a part of a previous review by Sanna *et al.* (1991b). Few papers have been reviewed in detail and the results re-analyzed according to various commonly reported criteria for predicting hearing outcome.

Review of literature

Middle cranial fossa approach

Harker and McCabe (1978), reported hearing preservation in six of 10 patients; three (30 per cent) of them had serviceable hearing. Wade and House (1984), reported on 20 patients (including 17 cases reported by Brackmann in 1979) who fulfilled their criteria of 30 dB pure tone average (PTA) and 70 per cent or better speech discrimination score (SDS). The average tumour size was 1.3 cm and hearing was preserved in 35 per cent of the cases. In 1986, Gantz *et al.* (1986) reported preservation of measurable hearing in 18 (43 per cent) of 42 cases, but only 26 per cent had serviceable hearing. Shelton

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et al. (1989) reported preservation of measurable hearing in 59 per cent of the 97 patients. In 1990, they found a significant loss of preserved hearing in 56 per cent of 25 cases, with a minimum follow-up of three years (Shelton *et al.*, 1990). Further, Shelton and Hitselberger (1991) reported on 37 patients with tumour size less than 0.5 cm including the intracanalicular component. Measurable hearing was preserved in 67.5 per cent while 46.2 per cent and 59.4 per cent of patients achieved good and serviceable hearing respectively.

Wigand *et al.* (1991) reported 206 cases operated by the extended middle fossa approach and preserved hearing in 51 per cent. Their series contained 71 per cent of intrameatal tumours and the size of the tumour ranged from 0.3 to 1.5 cm in 57 per cent cases. Hoehmann (1991) had seven (17 per cent) of 41 cases fulfilling the criteria of 50 dB PTA and 50 per cent SDS post-operatively. They experienced 75 per cent incidence of post-operative facial palsy, five per cent CSF leak and 10 per cent patients complained of continuing tinnitus.

Molony *et al.* (1992) reported on two cases operated via the middle fossa with intentional sacrifice of the superior canal for more space. They retained hearing in one patient within the criteria of 50 dB SRT and 50 per cent SDS. A similar possibility of hearing preservation in cases with violation of labyrinth was reported by McElveen *et al.* (1991) and Smith *et al.* (1993).

Doyle and Shelton (1993) recommended hearing preservation in certain NF2 cases on the basis of a report on 10 patients who underwent 13 procedures. They had 12 total removals amongst whom good hearing was retained in two (22 per cent), serviceable in four (44 per cent) and measurable in eight (61 per cent) patients. All the patients with complete removal and preserved hearing had tumour size within 1.5 cm and the criteria for reporting results was according to their previous classification.

Sterkers *et al.* (1994) reported on 27 and 22 hearing preservation attempts in two series from 1985-1990 and 1988-1992 respectively. No detailed audiometric data were available and success was determined on the basis of preservation of functional hearing defined as a fall of not more than 20 dB PTA or 20 per cent SDS as compared to pre-operative values. In the first series functional hearing was preserved in 11 (40.7 per cent) patients while in the second series of 22 intracanalicular tumours hearing was preserved in eight (36.4 per cent) cases.

Posterior fossa approach

Smith *et al.* (1977) attempted to save hearing in 10 patients; seven had some hearing post-operatively and only three of them had some SDS. DiTullio *et al.* (1978) preserved hearing in only one of 79 cases. A case of hearing preservation was reported by Wanxing (1981) and by Pifko and Pasztor (1981).

Tator and Nedzelski (1985) attempted to preserve cochlear nerve in 23 tumours of 2.5 cm or less. The hearing was preserved in six (31.6 per cent) of 19

patients with unilateral tumours, but it was serviceable in only three (15.7 per cent). In a series of 120 patients by Palva *et al.* (1985) hearing preservation was attempted in 30, preserved in 13 but useful speech discrimination was retained in only nine patients (30 per cent).

Silverstein *et al.* (1985) had 38 per cent overall success rate of total tumour removal and hearing preservation in 13 patients. The tumour size varied from intracanalicular to 3 cm protrusion medial to the porus. Their success rate was 54 per cent in tumours smaller than 1.5 cm. In 1986 they reported a success rate of 37 per cent (six of 16 cases) (Silverstein *et al.*, 1986).

In 1985, Abramson *et al.* reported their experience with intraoperative monitoring of eighth nerve in an attempt to preserve hearing in a series of 20 cases, with three small tumours (<2 cm), three moderate size tumours (2-3 cm) and 14 large tumours (>3 cm). Three patients with tumours of 2 cm or smaller retained functional hearing.

Gardner and Robertson (1988) could preserve hearing in two out of 10 cases (four via suboccipital approach and six through middle fossa). The post-operative hearing was unchanged or slightly poorer in five of seven cases of Bauch *et al.* (1990). Harner *et al.* (1990) reported preservation of "some hearing" in 45 (16.5 per cent) of 273 patients, but only 19 (7.9 per cent) of them had normal or serviceable hearing. Baldwin *et al.* (1990) attempted to preserve cochlear nerve in 44 patients, but only 20 (45 per cent) retained auditory function.

In 1992, Atlas *et al.* reported 22 cerebellopontine angle lesions including 20 vestibular schwannomas and two meningiomas. While the criteria for patient selection was on the basis of hearing loss less than 60 dB and tumour size less than 2 cm, the post-operative hearing was classified as useful if the patient fulfilled the 50/50 rule of Wade and House. Of the 11 (50 per cent) patients who had useful hearing post-operatively, six maintained it for 3-5 years. On excluding the two meningioma patients, overall rate of useful hearing preservation at the last follow-up was only 22 per cent (four of 18).

Nadol *et al.* (1992) reported on their experience of hearing preservation in 78 patients. In comparison to their previous report in 1987, the rate of useful hearing (PTA <70 dB and SDS >15 per cent) preservation seems to have declined from 73 per cent to 50 per cent in tumours with extension of less than 0.5 cm in the posterior fossa. Conversely the facial nerve function and other complications seem to have improved.

Chen *et al.* (1992) reported the 17th case of acoustic tumour in patients below age of 15 years. They reviewed previously documented 16 cases and stressed the importance of hearing conservation in these young patients; however none of the 17 cases could retain serviceable hearing.

McKenna *et al.* (1992) studied long term hearing outcome in 18 unilateral vestibular schwannoma patients. The follow-up ranged from three-11 years and 14 (78 per cent) patients experienced no

significant decline in hearing. The long term stability in hearing outcome did not correlate to the tumour size or pre-operative level of hearing.

Charabi *et al.* (1992) presented collective results in 59 cases operated in various hospitals of Denmark and stressed the importance of centralized treatment for acoustic tumours. They reported 16 cases in whom hearing preservation was the goal. While no patient retained any hearing post-operatively, the overall outcome in these 16 patients was unacceptable. There were two mortalities, 44 per cent incidence of complications like CSF leak, meningitis and only six per cent had Grade I/II facial nerve function post-operatively.

In 1992, Harper *et al.* reported on 84 vestibular schwannoma patients who had intra-operative brainstem auditory evoked potentials (BAEP) monitoring and 86 patients without monitoring. Hearing was said to be preserved when PTA was ≤ 65 dB and it was taken as useful when if SDS score was more than 40 per cent. Hearing was preserved in 31 (37 per cent) of 84 monitored and in 19 (22 per cent) of 86 unmonitored patients. Useful hearing at a follow-up of three months was achieved in 17 (20 per cent) of 84 monitored and in six (seven per cent) of 86 unmonitored patients.

Tatagiba *et al.* (1992) reported on 186 patients (189 tumours) and claimed functional hearing preservation in 92 (49 per cent) cases. Hearing results were classified as good (PTA < 30 dB), fair (PTA 31–60 dB), poor (PTA 61–90 dB) and deafness (PTA > 91 dB). Functional hearing denoted average speech discrimination of at least 80 per cent (for good hearing) and 30 per cent (for fair). The audiologic data were taken two to three weeks post-operatively and were not expressed in detail. While good hearing was retained in 16 (8.6 per cent) of 186 patients, fair and poor hearing was achieved in 44 (23.6 per cent) and 32 (17.2 per cent) patients respectively.

Mangham and Skalabrin (1992) reported on 77 cases and claimed hearing preservation in 35 per cent. Of the hearing preserved patients, hearing was reported to be better in 11 per cent, same in 81 per cent and worsened in eight per cent.

Mazzoni *et al.* (1993), achieved measurable hearing in 40 (44 per cent) of 90 patients. They used the Shelton-Brackmann classification and achieved good hearing in 11 (12 per cent) of 90 patients and serviceable in 23 (25 per cent). They reported of normal facial nerve function in 78 per cent. CSF leak occurred in 6.6 per cent, meningitis in 2.2 per cent, lower cranial paralysis in three per cent and ataxia in two per cent of the 90 cases.

In 1994, Sterkers *et al.* reported preservation of functional hearing in 32.3 per cent of 34 and 38.2 per cent of 34 in two separate series between 1985–1990 and 1988–1992 respectively.

Tucci *et al.* (1994) reviewed 36 patients and classified hearing as preserved when there was less than 20 dB deterioration in SRT and less than 15 per cent decrease in SDS; preserved but diminished if there was usable hearing that did not meet the above

criteria and not preserved when no usable hearing remained post-operatively. Of these 36 patients hearing was preserved in 53 per cent, preserved but diminished in 14 per cent and not preserved in 33 per cent. Further, hearing could not be preserved in any patient undergoing total tumour resection and having tumour size more than 1.5 cm. Amongst the 17 patients available for long term follow-up (range 1.5–8 yrs), three patients had recurrent tumours.

Umezu and Aiba, in 1994, reported on 66 patients who underwent total tumour removal in the last five years. While only 27 (40.9 per cent) patients had serviceable hearing pre-operatively, eight (29.6 per cent) of them had it post-operatively.

Detailed review

Some articles which provided detailed patient data were reviewed in detail. To compare the results uniformly, data were re-calculated on the basis of the criteria of normal hearing (defined as PTA of 30 dB or better and SDS of 70 per cent or better); serviceable hearing (defined as PTA of 50 dB or better and SDS of 50 per cent or better), measurable hearing (defined as any measurable hearing) and according to the A1 grade (defined as PTA of 20 dB or better and SDS of 80 per cent or better) of our classification (Table I).

Sterkers *et al.* (1984) reported a series of 150 cases, of which 135 had pre-operative hearing. Post-operatively, preservation of measurable hearing was possible in 31 (23 per cent) cases and serviceable hearing (50/50 rule) in 10 (7.4 per cent) patients. There were only four (three per cent) patients who had PTA of 30 dB or better and SDS of 70 per cent or better and no patient fell within the A1 grade of our classification. Amongst the total 31 patients with some hearing preserved, 19 had tumour size less than 1.5 cm including intracanalicular tumours. They had one recurrence and the facial nerve function was Grade I/II in 77 per cent of the total 150 patients.

Cochlear nerve was preserved in 21 of 22 patients of Ojemann *et al.* (1984). SDS of more than 35 per cent was retained in three of four patients with 1 cm tumour, two of eight with 1.5 cm tumour, in two of six with two to 2.5 cm tumour and in one of four with a tumour of 3 cm or more. Two other patients with 1.5 cm tumours had SDS of less than 35 per cent and one with 2 cm tumour retained only sound perception. PTA were not reported. There were only six (27.3 per cent) of 22 patients with SDS of 70 per cent.

Nadol *et al.* (1987) preserved useful hearing (defined as SRT no poorer than 70 dB and SDS of at least 15 per cent) in 73 per cent of cases in which the extrameatal tumour extension was less than 0.5 cm and 22 per cent of cases with tumour extension greater than 2.5 cm. However, normal hearing was preserved in only one (1.4 per cent) of 69 tumours with posterior fossa extension greater than 2.5 cm and 11 of 69 (15.9 per cent) cases with tumour extension less than 0.5 cm.

Sanna *et al.* (1987) attempted hearing preservation in 34 cases. Ten of 20 cases (50 per cent) operated through middle fossa retained measurable hearing, four (20 per cent) had serviceable hearing according to 50/50 rule and no patient had normal hearing according to the 30/70 criteria or according to the A1 grade of our classification. Only four of 14 (28.6 per cent) patients operated through suboccipital approach, retained measurable hearing while no patient maintained serviceable hearing or better.

Kemink *et al.* (1990) reported 20 cases in which hearing preservation was attempted via the posterior fossa approach with successful result in 13 cases (65 per cent) and excellent results in tumours less than 1.5 cm. Retabulating their results, measurable hearing was seen in 13 (65 per cent) of 20 cases, serviceable in 10 (50 per cent) and normal hearing according to 30/70 as well as according to A1 grade in seven (35 per cent) of cases. Facial nerve function was Grade I/II in 16 (80 per cent) of 20 patients.

Jenkins in 1992, presented 14 cases who underwent hearing preservation acoustic tumour surgery. There were nine intracanalicular tumours and five with an extracanalicular extension less than 1.5 cm. Ten patients had a follow up of more than one year. Amongst these 10, six patients underwent middle fossa procedure and the rest a posterior fossa approach. There were six (60 per cent) patients who preserved serviceable hearing while only one (10 per cent) preserved normal hearing according to 30/70 criteria. There was no post-operative persistent facial nerve dysfunction in this series.

Fischer *et al.* (1992) reported of 99 hearing preservation attempts via the retrosigmoid approach on 85 unilateral schwannomas and 14 NF2 patients. The results were reported according to the classification of Shelton *et al.* On recalculating their results measurable hearing was preserved in 29 (29.33 per cent) of 99 patients, serviceable in 14 (14.14 per cent), normal in 10 (10.10 per cent) and A1 class of our classification in only five (5.05 per cent) cases. Twenty (69 per cent) of the 29 patients had stable hearing at a follow-up ranging from two–12 years. The facial nerve function was Grade I/II in 65 (65.65 per cent) of the 99 patients.

Cohen *et al.* in 1993 reported of hearing preservation results in 161 cerebellopontine angle lesions operated between 1974–1991. Amongst the 119 vestibular schwannomas with intact cochlear nerve, serviceable hearing was preserved in 37 (31.02 per cent) cases, normal hearing in 12 (10 per cent) and A1 grade of our classification in only seven (5.88 per cent) patients. The facial nerve function was Grade I/II in 93 per cent of the 161 patients.

Glasscock *et al.* (1993), presented an audiological detailed paper on 136 unilateral tumour patients and 25 NF2 patients. This series comprised cases operated by both the middle and the posterior fossa approaches. While any level of hearing was taken as preserved, hearing was considered as audible if PTA <70 dB and SDS is 70 per cent. On re-analyzing their results measurable hearing was preserved in 48 (35 per cent) of the 136 unilateral

patients and in seven (24 per cent) of the 25 bilateral tumour patients. Serviceable hearing was seen in 37 (27.20 per cent) of unilateral and three (12 per cent) of bilateral patients. Normal hearing according to the 30/70 criteria was achieved in 17 (12.5 per cent) of unilateral and three (12 per cent) of bilateral patients. Finally, A1 grade of our classification was obtained in only three (2.2 per cent) of unilateral and none of bilateral patients. The follow-up averaged 6.5 years and there was one recurrence in a NF2 patient. The facial nerve function was reported in only 81 of the 136 unilateral neuroma cases and it was Grade I/II in all of them.

Brackmann *et al.*, in 1994, reported on 24 vestibular schwannoma patients operated via the middle fossa approach between January to December 1992. The total tumour size, including intracanalicular portion, ranged from 0.5–1.8 cm. Measurable hearing was preserved in 17 (71 per cent) of 24 patients. While serviceable hearing could be preserved in 13 (54.16 per cent) patients, only eight (33.33 per cent) patients satisfied the 30/70 criteria of normal hearing. According to the A1 grade of our classification, only three (12.5 per cent) of 24 patients were eligible for normal hearing.

Classification problems

The major problem in evaluating the results of hearing preservation after vestibular schwannoma surgery is the different criteria adopted by various authors. A variety of classifications have been proposed. Wade and House (1984) described the 50/50 (PTA \leq 50 dB and SDS \geq 50 per cent) rule for serviceable hearing and considered the hearing as normal if PTA was \leq 30 dB and SDS \geq 70 per cent. In 1984, Jannetta classified the PTA in five grades from normal to profound hearing and SDS in five grades from normal to non-useful hearing. Cohen and associates (1986) divided their cases into: excellent hearing (PTA 30 dB and SDS 80 per cent), good (PTA 30–60 dB and SDS 60 per cent) and poor (PTA 60 dB and SDS 60 per cent). Later in 1993, they classified patients into those with good hearing reserve (SRT \leq 30 dB and SDS \geq 70 per cent) and those with marginal reserve (SRT 31–50 dB and SDS 50–69 per cent).

In 1986, Silverstein *et al.* suggested five classes: class I-good (PTA 0–30 dB and SDS 70–100 per cent), II-serviceable (PTA 35–50 dB and SDS 50–65 per cent), III-non-serviceable (PTA 65–75 dB and SDS 25–45 per cent), IV-poor (PTA 80–100 dB and SDS 0–20 per cent), class V with no serviceable hearing. Gardner and Robertson (1988) suggested a modification of Silverstein's classification with little changes in PTA and SDS ranges.

Shelton and Hitselberger (1991) followed the criteria proposed by Wade and House and divided the results as: good hearing (SRT \leq 30 dB and SDS \geq 70 per cent), serviceable hearing (SRT \leq 50 dB and SDS \geq 50 per cent) and measureable hearing.

Samii (1991, personal communication), proposed a classification dividing pure tone thresholds at

TABLE I
SANNA CLASSIFICATION FOR HEARING PRESERVATION IN ACOUSTIC
NEUROMA SURGERY

Class	PTA (dB)*	SDS (%)†	Class
1	0–20	100–80	A
2	21–40	79–60	B
3	41–60	59–40	C
4	61–80	39–20	D
5	81–100	19–0	E
6	>100	—	F

* = pure tone thresholds at 0.5, 1, 2, 4 KHz.

† = speech discrimination score.

1–3 kHz into five groups: A1-good hearing (0–30 dB), A2-fair (31–60 dB), A3-bad (61–90 dB), A4-functional (91–120 dB), A5-deafness (>120 dB) and SDS into five groups: normal, 100 per cent; good, 95–66 per cent; fair, 65–33 per cent; bad, 32–5 per cent and lost, zero per cent.

Sanna *et al.* (1991b), proposed a simplified classification for reporting the hearing preservation results (Table I). It consists of six classes starting from 0–20 dB with 20 dB increments, considering PTA at 500–4000 Hz and similarly six classes for SDS with decrements of 20 per cent, starting from 100 per cent to zero per cent. This classification is easy to remember because of regular steps of 20 and includes 4000 Hz frequency in PTA, which is fundamental in speech intelligibility.

Jenkins (1992) classified patients as: serviceable if PTA >50 dB and SDS >50 per cent; borderline serviceable if some discrimination (>20 per cent) was present with moderate pure tone loss and non-serviceable if there was no speech discrimination.

Mangham and Skalabrin (1992) proposed a new classification system; hearing was better if the post-operative PTA was better by more than 20 dB compared to pre-operative value or the SDS was better post-operatively. Hearing status was taken as same if the post-operative PTA was within a 20 dB change compared to pre-operative value and the SDS remained same. Hearing status was taken as worse and much worse if the post-operative PTA was worse by less than 20 dB and less than 60 dB respectively when compared to pre-operative levels. Any deterioration in post-operative SDS was also taken as worse or much worse depending on the corresponding PTA values.

Discussion

Hearing preservation is now considered as the ultimate goal in vestibular schwannoma surgery. Although various reports have appeared in the literature, very few of them have made a genuine effort to report the data in detail. While post-operative data are often missing or incomplete (Rand, 1982; Samii *et al.*, 1985; Palva *et al.*, 1981), adequate stress on the hearing quality achieved is often not given. Consequently, the real ability of hearing preservation still remains doubtful. In an effort to throw some light, this study reviews 57

papers dealing with the issue of hearing preservation.

Although this review does not focus in detail on the issues such as choice of approach, effect of tumour size and pre-operative prognostic factors; certain general trends need to be mentioned. While literature reflects that more surgeons prefer the posterior fossa route, the hearing preservation incidence seems to be the same irrespective of the type of approach. Secondly, there seems to be general agreement that better prospects of hearing preservation are available in cases with smaller tumours. Pathological pre-operative ABR status is taken as a poor prognostic factor by some authors'.

Even if good pre-operative hearing does not always correlate with better post-operative outcome, it seems logical to attempt hearing preservation only in the cases having normal or good pre-operative hearing. Also, to obtain optimal binaural hearing, important consideration should be given to the contralateral ear. If the contralateral ear is normal and the difference of hearing in both the ears is more than needed for the avoidance of Stenger effect, then such a hearing, though successfully preserved, is of no use to the patient. Hinton *et al.* (1992) pointed out that unlike tympanoplasty patients, a large number of vestibular schwannoma patients have good hearing in the contralateral ear; thereby increasing the probability that hearing preservation in vestibular schwannoma surgery while possibly satisfying the surgeon, will often fall short of the patients expectations. Only recently has long term follow-up become available for patients who had undergone successful hearing preservation. Although such reports are few, there appears to be a tendency for progressive deterioration of hearing with time in about 30–56 per cent of patients.

When one considers hearing preservation, the criteria for defining success must be clearly defined. However, on reviewing the literature an obvious disagreement on the basis of selection of cases and the sheer disarray in reporting results, makes one guess about the real possibility of hearing preservation. While some report results according to certain proposed classifications, some take successful results as a mere persistence of any measurable hearing. When the results of few pertinent papers were re-analysed according to the various commonly used criteria it became evident that normal hearing (at least 30 dB PTA or better and 70 per cent SDS or better) can be achieved only in a minority of patients. Thus, especially in reports with inadequate and unclear data, the claims of "measurable hearing" preservation might be often the claims of "miserable hearing". Till and until the neuro-otologic literature agrees upon uniform criteria valid comparison between various studies will not be possible and the reported results would be often misleading.

Conclusions

Hearing preservation in vestibular schwannoma surgery thereby, appears to be either a perplexing

fact or a probable fantasy. In attempting this elusive goal one should not forget the price to be paid. While some recent studies document the rate of complications, many of the early reports fail to do so. Even though total tumour removal and normal facial nerve function is being achieved in many cases, the probable microscopic infiltration of the cochlear nerve leading to recurrent tumours is still a matter of dispute. While few studies on long term hearing preservation results do exist, only two of them comment on tumour recurrence. As a reason more studies are needed before affirming about the relative risks of tumour recurrence in hearing conservation vestibular schwannoma surgery.

The number of ideal candidates for hearing conservation procedures will increase in the near future owing to improvements in diagnostic techniques, instrumentation and intra-operative monitoring. Before counselling a patient and extending him the choice of a hearing conservation procedure, cautious conclusions must be drawn from the existing literature. Until the present confounding issues are settled and a worldwide acceptable classification has been defined, it is recommended to provide all the necessary details of each and every case.

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