

*Short Communications/Kurze Mitteilungen*

**10 Years of Experience with Intratympanally Applied Streptomycin (Gentamycin) in the Therapy of Morbus Menière**

Chl. Beck and C. L. Schmidt

Universitäts-Hals-Nasen-Ohrenklinik (Direktor: Prof. Dr. Chl. Beck),  
Killianstraße 5, D-7800 Freiburg i. Br., Federal Republic of Germany

**Summary.** During the last 10 years a total of 83 patients with severe cases of unilateral Morbus Menière were treated in our clinic. The proposed therapy was to administer streptomycin (gentamycinsulfate) intratympanically by applying two different ways of procedure. In the first group of 40 patients we attempted to destroy the vestibular organ without harming the cochlea whereby we avoided surgical intervention. In the second group of 43 patients we integrated more recent findings in the pathophysiological mechanism underlying the pathogenesis of Morbus Menière into our therapeutic considerations and attempted to exclusively destroy the secretorial epithelium with minimal dosages of aminoclycosid antibiotics. The results after treatment were clearly better for the second group of patients.

**Key words:** Morbus Menière — Intratympanal streptomycintherapy — 10 years of experience.

The ototoxicity of basic streptomycin antibiotics has long been recognized. Schuknecht (1957) utilized this observation to devise a therapeutic procedure for the treatment of unilateral Morbus Menière with intratympanally applied streptomycin. Yet, the dread of ensuing deafness — the inevitable consequence — did not permit this procedure any routine importance. Later, studies of animal experiments brought about new aspects of this field, proving that by applying Ozothin before streptomycin the vestibular sensory cells of guinea pigs and apes could be exclusively damaged (Lange, 1968, 1971), i.e., the cochlea could be spared from the damaging effects of streptomycin (Holz et al., 1966). These studies provided the impetus for the execution of an intratympanal streptomycin therapy (later gentamycin) for Morbus Menière at the Freiburg ENT-clinic, beginning in 1967 (Lange, 1968). The intratympanical streptomycin therapy was initiated under the impression that, thanks to Ozothin®, the vestibular sensory cell activity could be blocked without the cochlear function being simultaneously disturbed.

Between 1967 and 1977 we treated 83 patients suffering from severe unilateral Morbus Menière in our clinic. From the time the therapy was initiated until 1973, our strategy for treatment was to destroy the vestibular organ avoiding surgery. By necessity hearing impairment and, at its worst, deafness, had to be occasionally taken into the bargain. During this time period 43 patients were treated. The therapeutic results are summarized in Table 1 (Lange, 1968).

In the meantime more became known about the pathophysiological mechanism underlying the genesis of Morbus Menière and a new procedure for treatment was conceived. In the years to follow, we no longer strove to destroy the vestibular organ, but rather the secretorial epithelium with ototoxic medications. However, this procedure had to be interrupted as soon as the slightest sign of inner ear damage was indicated: The patient's subjective apprehension of even slight dizziness, a spontaneous nystagmus, or — via audiograms performed daily — inner ear hearing difficulties (in all cases at least partially reversible). We have summarized our findings after treatment of this group of 40 patients in Table 2. In comparison to the first group of patients, the results are better in all of the points designated. Above all, we observed significantly less deterioration in hearing and, in fact, in a few cases, hearing improvement. At any rate, we eliminated the risk of deafness. Our criterion for improvement or deterioration in hearing was a change of more than 10 dB in the inner ear performance. Only the treatment with tinnitus remained, as before, problematic. The patients, for whom an improvement or deterioration in earsound is designated in our table, suffered under this disturbance either during a seizure or, when during a seizure-free interval, then only occasionally and to a less severe degree. For those patients who expressed persisting ear sound an amelioration was in no way realizable.

Since we tried to manage with the smallest dosage possible, we had to discontinue treatment of a few patients prematurely. These patients then suffered further, although clearly less severe, seizures. They were readmitted for hospitalization and, after two to three further dosages of the antibiotic, the residual condition could be relieved. Comparing findings before and after treatment, all of the patients listed in Table 2 displayed no changes in caloric reaction with respect to the treated ear. An average of six dosages of gentamycinsulfate (Refobacin®), each dosage amounting to 30 mg, were planned. The average hospitalization time lasted 10 days.

The mechanism underlying the therapeutic reaction remains to be discussed. The sensory cells on the cristae of the semicircular canals are surrounded by structures, in which the dark cells particularly stand out. Their morphological construction, extensively documented by electron microscopic research, indicate an accompaniment in secretorial and resorptive processes by means of a sodiumphosphate pump during high enzyme activity (Kimura et al., 1964; Dohlmann, 1965; Nakai and Hilding, 1968; Kimura, 1969; Hiraide, 1971; Sparwald et al., 1971). Experimental investigations with animals now disclose that the dark cells are damaged by streptomycin before the sensory cells are. Moreover, it appears that the damage, in contrast to that of the vestibular cells, is to a lesser degree reversible.

These observations offer an informal explanation for the success we have witnessed in the treatment of Morbus Menière with intratympanically administered streptomycin or gentamycin, in particular because the results were not negatively influenced by an exclusion of Ozothin®. There is no question that the possibility for

**Table 1.** Pat. 1—43. Streptomycin- resp. gentamycin-therapy

---

Content with treatment	37 = 86.00%
Vertigo	
Disappeared	39 = 90.69%
Improved	1 = 2.32%
Unchanged	3 = 6.97%
Hearing	
Unchanged	18 = 41.86%
Improved	0 = 0.00%
Deteriorated	22 = 51.16%
Deafness	3 = 6.97%
Tinnitus	
Disappeared	35 = 81.39%
Improved	2 = 4.65%
Unchanged	1 = 2.32%
Deteriorated	5 = 11.62%
Pressure feeling	
Disappeared	36 = 83.72%
Improved	5 = 11.62%
Unchanged	2 = 4.65%

---

**Table 2.** Pat. 44—83. Streptomycin- resp. gentamycin-therapy

---

Content with treatment	38 = 95.00%
Vertigo	
Disappeared	37 = 92.50%
Improved	1 = 2.50%
Unchanged	2 = 5.00%
Hearing	
Unchanged	29 = 72.50%
Improved	5 = 12.50%
Deteriorated	6 = 15.00%
Deafness	0 = 0.00%
Tinnitus	
Disappeared	35 = 87.50%
Improved	3 = 7.50%
Unchanged	2 = 5.00%
Deteriorated	0 = 0.00%
Pressure feeling	
Disappeared	37 = 92.50%
Improved	3 = 7.50%
Unchanged	0 = 0.00%

---

isolated destruction of those cells primarily involved in the pathogenetical mechanism behind Morbus Menière exists. This destruction of the dark cells influences the production of the endolymph, which in turn impedes the development of hydrops in the endolymph space. With cautious dosage of the antibiotic and precise, regular observance of the vestibular reaction, the desired therapeutic results can be realized without significantly constricting the vestibular sensory cell or cochlear sensory epithelium functions.

## References

- Dohlman, G. F.: The mechanism of secretion and adsorption of endolymph in the vestibular apparatus. *Acta oto-laryng.* (Stockh.) **59**, 276 (1965)
- Hiraide, F.: The histochemistry of dark cells in the vestibular labyrinth. *Acta oto-laryng.* (Stockh.) **71**, 40–48 (1971)
- Holz, E., Stange, G., Terajama, Y.: Minderung der Ototoxicität des Streptomycin anhand tierexperimenteller Untersuchungen. Vortrag IV. Int. Kongr. f. Infektionskrankheiten. München: Schattauer 1966
- Kimura, R., Landquist, P.-G., Wersäll, J.: Secretory epithelial linings in the ampullae of the guinea pig labyrinth. *Acta oto-laryng.* (Stockh.) **57**, 517–530 (1964)
- Kimura, R. S.: Distribution, structure, and function of dark cells in the vestibula labyrinth. *Ann. Otol.* (St. Louis) **78**, 542–561 (1969)
- Lange, G.: Isolierte medikamentöse Ausschaltung eines Gleichgewichtsorgans beim Morbus Menière mit Streptomycin-Ozothin. *Arch. klin. exp. Ohr-, Nas.- u. Kehlk.-Heilk.* **191**, 545 (1968)
- Lange, G.: Intratympanale Streptomycin-Therapie des Morbus Menière. *Fortschr. Med.* **14**, 609–611 (1971)
- Nakai, Y., Hilding, D.: Vestibular endolymph-producing epithelium; electron microscopic study of the development and histochemistry of the dark cells of the Crista ampullaris. *Acta oto-laryng.* (Stockh.) **66**, 120–128 (1968)
- Schuknecht, H.: Ablation therapy in the management of Menière's disease. *Acta oto-laryng.* (Stockh.) (Suppl.) **132**, 1 (1957)
- Sparwald, E., Merck, W., Leupe, M.: Restitutionsvorgänge an den dunklen Zellen und Sinneszellen der Crista ampullaris des Meerschweinchens nach Streptomycinintoxikation. *Arch. klin. exp. Ohr-, Nas.- u. Kehlk.-Heilk.* **204**, 17–26 (1973)
- Sparwald, E., Lange, G., Leupe, M.: Veränderungen an den dunkeln Zellen der Crista ampullaris nach Streptomycinmedikation beim Meerschweinchen. *Arch. klin. exp. Ohr-, Nas.- u. Kehlk.-Heilk.* **199**, 587–590 (1971)

Received March 22, 1978