

The Treatment of Annoying Tinnitus with Electrical Stimulation

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I'd like to discuss our experience with transcutaneous electrical stimulation as a treatment of tinnitus. I'd like to acknowledge my coauthor Gaye Cronin, who treated many of the patients in this study. Usually, the treatment of tinnitus is not easy. Electrical stimulation has been used to treat a number of disorders, including pain, tissue injury, circulation impairment, and the like. A number of authors have reported a decrease in tinnitus with electrical stimulation. This usually has been noticed in the treatment of profound hearing loss, using direct stimulation of the cochlea and, of course, this is not practical with the usual tinnitus patient.

Encouraged with these results, and his own observations, in 1981, Chouard [1] reported 64 patients whom he treated with transcutaneous electrical stimulation for annoying tinnitus. He reported that 47% of his patients realized some improvement in their tinnitus. In 1989, Kuk [2] et al. reported using transtympanic electrical stimulation in 10 patients for the treatment of annoying tinnitus. These researchers used currents up to 2 mA and reported that 50% of the patients had improvement in their tinnitus with some residual inhibition.

METHODS

With this background then, I would like to report on our experience with 500 patients who have had treatment with transcutaneous electrical stimulation for annoying tinnitus. The average age of the patients was 46 years. There were 269 males and 231 females. Sixty percent of the patients had bilateral tinnitus, and the average duration of the tinnitus was 2.3 years.

Sensorineural hearing loss and Menière's disease comprise most of the etiologies of tinnitus in this study, with a smattering of other etiologies. All patients received an otological history and physical, complete audiometry and, if they had asymmetrical hearing loss or unilateral tinnitus, an ABR.

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Each patient was asked to judge his or her tinnitus on a subjective scale of 1-10, 1 being barely noticeable and 10 being intolerable. Patients were asked to do this before and after each treatment session. The instrument used to deliver the electrical stimulation was a Neuroprobe 500. This unit is used mainly in pain control and is available in many physical therapy clinics. The electrical stimulation is delivered by a hand-held probe with a small gold ball electrode. The patient is seated in a comfortable chair with the therapist at the patient's side, and the electrical stimulation then is delivered to the external ear, using 20 points around the external ear and tragus. In the protocol used, each point was stimulated for 30 seconds two times in each treatment. The waveform was an alternating current with an intensity of 0.5 to 1.0 mA. The number of visits for each patient was between 6 and 10.

RESULTS

Fifty-three percent of the patients noticed an improvement in their tinnitus. This was demonstrated by a decrease of at least two points in their subjective rating. Seven percent of the patients had complete suppression of their tinnitus. Fifty-two percent of the men were improved. Forty-eight percent of the women were improved and, there was no difference in patients who were older and younger than 50 years. Considering the different etiologies, most had a success rate of around 50%. Each patient was contacted approximately 3 months after the cessation of their treatment, and 72% reported a sustained benefit from the electrical stimulation in decreasing their tinnitus. If we subtract the Menière's disease patients, who are notorious for fluctuations in their tinnitus, 94% had a sustained benefit for at least 3 months.

The subjective rating pretreatment averaged 8, with a range of 3-10. After treatment, the average was 4, with a range of 0-10. So, the average improvement was 4 on the subjective rating scale for the improved patients.

We were interested in whether brainstem audiometry had any predictive value. Eighty-five of the first 260

patients had brainstem audiometry and there is no significant difference between the patients with normal and those with abnormal brainstem audiometry.

Thirteen patients noticed that the electrical stimulation made their tinnitus worse. The treatment was stopped, and in 11 of the patients, and their tinnitus returned to their pretreatment level. Two patients had permanent increase in their tinnitus from the electrical stimulation. Two patients developed contact dermatitis from the gold electrode, which cleared when the treatment was stopped. No patient developed vertigo or hearing loss.

DISCUSSION

Why does electrical stimulation work? One possible reason is a direct effect on the cochlea. A second reason might be improved cochlear flow, as this has been shown to take place in the different parts of the body with electrical stimulation, and a third possible reason could be related to the gate theory of pain. The gate theory of pain says that there are cutaneous fibers that might control central modifiers, and stimulation of the peripheral sensory nerves can modify the perception of pain. In the same manner then, electrical stimulation of the peripheral sensory nerves may have some control

over a central gate that might modify the perception of pain. Obviously, these all are speculative theories. The possibility of a placebo effect has been addressed by Kuk [2], Chouard [1], and Bauer [3] and was believed to be negligible. A psychotherapeutic effect is possible because of the time patients spent with the physical therapists and the therapists' interest in the patients.

In summary, our conclusions are that (1) this study compares favorably with previous studies of transcutaneous electrical stimulation in the treatment of tinnitus, (2) electrical stimulation seems to be safe as a treatment for tinnitus, and (3) transcutaneous electrical stimulation seems to be successful in approximately 50% of patients in annoying tinnitus.

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