SUPPRESSION OF TINNITUS IN PATIENTS UNDERGOING COCHLEAR IMPLANTATION

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Abstract - Tinnitus is a frequent complaint in patients with sensorineural deafness. Different reports suggest that electrical stimulation caused by cochlear implant devices supresses tinnitus to a considerable degree. In a longitudinal study we have evaluated the severity and duration of tinnitus in both ears of 17 cochlear implant patients before and after operation. Severity of tinnitus was reduced in both implanted and not implanted ears after the implantation (P=0.003 and p=0.004 respectively). Duration of tinnitus, however, was not affected significantly. No significant difference in tinnitus suppression was observed between the implanted and not implanted ears. This might be attributed to both the electrical stimulation caused by the device and the psychogenic stability provided by return to the world of sound.

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INTRODUCTION

Tinnitus is a frequent complaint in patients with sensorineural deafness and it is sometimes so severe that it becomes intolerable (1-3). Different authors have reported different but often high degree of tinnitus suppression in cochlear implant patients which has been attributable to electrical stimulation from the device (1,3-6). In these reports a relation between degree of suppression and time past since surgery and mode of stimulation have been suggested (1,3,6). In this study, we have evaluated the severity (loudness) and the duration of tinnitus in 17 of our cochlear implant patients before and after implantation.

MATERIALS AND METHODS

Twenty five patients who had undergone cochlear implantation for severe to profound sensoroneural hearing loss were evaluated (7). All implantations were performed in Amir-Alam hospital by the Cochlear Implantation Center of Tehran University of Medical Sciences from 1991 to 1997. The severity (loudness) and duration of tinnitus were questioned by an audiologist who performed all other audiologic evaluations of the patients before and after implantations.

Severity was scaled as "none", "mild", "moderate" or "severe". Duration was, similarly, scaled as "never", "sometimes", "often", or "always". In order to evaluate the degree of reduction in severity or duration of tinnitus any one-degree change (such as "severe" to "moderate" or "often" to "sometimes") was named as "small". Likewise, any two-degree change was named as "moderate" and any three-degree change as "marked". It should be noted that both ears of each patient were examined and each ear was considered as one case. Patient underwent implantation using Clarion®, Nucleus 22® or Nucleus Spectra 22® devices. It should also be pointed out that, due to retrospective nature of data collection method, not all the information was available for every patient. Thus some patients had to be excluded from some comparisons and tables.

RESULTS

The study population comprised of 17 cochlear

implant patients (12 female and 5 male). The youngest patient was 6 and the oldest was 51 years old (mean age 23±12.7). Data for the rest of the patients was not available, mostly due to low age of patients that made it impossible to assess the tinnitus. Etiology of deafness is presented in Fig. 1. Mean time lapsed since beginning of deafness was 7.65±6.69.

Severity and duration of tinnitus before implantation is shown in Tables 1 and 2 respectively. As shown in these tables, except

Table 1. Degree of tinnitus severity before implantation

Severity	No. of ears	percent
None	1	2.9%
Mild	1	2.9%
Moderate	9	26.5%
Severe	23	67.6%

Table 2. Duration of tinnitus before implantation

Duration	No. of ears	percent
Never	1	3.6%
Sometimes	11	39.3%
Often	10	35.7%
Always	6	21.4%

for one patient, all were suffering from varying degrees of tinnitus, which was moderate or severe in more than 94% of the cases. Tinnitus had not been considered a factor in choosing the ear to be implanted and the difference between the severity or duration of tinnitus in the ears implanted and not implanted was not found to be significant using Wilcoxon matched-pairs signed-ranks test (p=0.593).

Severity and duration of tinnitus after implantation for the implanted and not-implanted ears are summarized in Tables 3 and 4 respectively.

As shown in these tables, median for severity and duration of tinnitus for implanted and not-implanted was "mild" and "often" respectively.

Table 3. Severity of tinnitus after implantation

severity	implanted	not-implanted
None	3 (17.6%)	2 (11.8%)
Mild	12 (70.6%)	11 (64.7%)
Moderate	2 (11.8%)	4 (23.5%)
Severe	0	0

Neither the severity nor the duration of tinnitus was different for the ears implanted and not-implanted as tested by Wilcoxon matched-pairs signed-ranks test.

Table 5 and 6 summarize the reduction in severity and duration of tinnitus.

Table 4. Duration of tinnitus after implantation

Duration	implanted	not-implanted
Never	2 (16.7%)	2 (16.7%)
Sometimes	2 (16.7%)	3 (25.0%)
Often	6 (50.0%)	5 (41.7%)
Always	2 (16.7%)	2 (16.7%)

Table 5. Reduction in severity of tinnitus after implantation

Severity	implanted	not-implanted
None	0	1 (5.9%)
Small	7 (41.2%)	9 (52.9%)
Moderate	8 (47.1%)	6 (35.3%)
Marked	2 (11.8%)	1 (5.9%)

Table 6. Reduction in duration of tinnitus after implantation

Duration	implanted	not-implanted
None	4 (36.4%)	5 (45.4%)
Small	4 (36.4%)	4 (36.4%)
Moderate	2 (18.2%)	2 (18.2%)
Marked	1 (9.0%)	0

As shown in these tables, median reduction of severity of tinnitus for implanted and not-implanted was "moderate" and "mild" respectively, but the Wilcoxon matched-pairs signed-ranks test failed to prove statistical significance in this difference (p=0.327). Median reduction of tinnitus duration was "small" for both implanted and not implanted ears.

Tinnitus severity after the implantation was

significantly reduced in both implanted and not-implanted ears as proved by Wilcoxon test ($p=0.0003$ and $p=0.004$ respectively) dropping from a median of "severe" to "mild" in both groups. Reduction of tinnitus duration has not been so impressive, however, dropping from a median of "often" to "sometimes" (not significant). None of the patients reported aggravation of tinnitus severity or duration.

A very slight (but significant) negative correlation was found between the duration of deafness and degree of reduction in tinnitus severity ($r=0.256$, $p=0.042$). Etiology of deafness had no effect on suppression of tinnitus.

DISCUSSION

Cochlear implantation has not only been a way out of silence for our patients but also a way of leading an almost normal life with disappearance or marked reduction of the many problems associated with deafness. Tinnitus is one of these problems which is suppressed by cochlear implantation (1-6). Suppression was previously reported to be more marked in the severity of tinnitus than in its duration(1), a finding that was also supported by our study. Reduction of severity was marked in our study but reduction in duration of tinnitus though apparent, was not statistically significant. Another interesting point is lack of significant difference in tinnitus suppression between the implanted and not-implanted ears. This can be both attributed to electrical stimulation caused by the device and the improved quality of life of the patients (7). Also the important role of improvement in the quality of life and psychogenic stability in tinnitus suppression has been emphasized by Ito (1).

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