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ORIGINAL ARTICLE

EVALUATION OF SENSORINEURAL HEARING LOSS IN HYPOTHYROIDISM

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ABSTRACT:
Background: The influence of the thyroid gland on hearing and the inner ear is one of the concerning factor in the area of medicine in today's scenario. There are both clinical and laboratory evidences that hypothyroidism produces derangement in the hearing and vestibular system. Hypothyroidism is a cause of genetic and environmentally induced deafness. Hearing loss has been reported to be associated with thyroid disorders. Hence; we undertook the present study to assess the origin of hearing loss in hypothyroid cases. **Materials & methods:** The present study included assessment of 60 patients who reported with the chief compliant of hypothyroidism and were undergoing treatment for the same for past minimum of 1 year. All the patients were divided into two study groups. Group 1 comprised of the patient group while Group 2 comprised of the control subjects. All the follow-up records were recorded and analyzed with SPSS software. **Results:** The mean threshold of hearing at 250 frequencies in group 1 at pre-treatment and post-treatment time was 18.9 and 18.01 dB respectively. Significant results were obtained while comparing the mean thresholds at pre-treatment and post-treatment time at 4000 Hz and higher frequency. Significant results were obtained in comparing the mean threshold in group 2 at pre-treatment and post-treatment time at frequency of less than 2000 Hz. **Conclusion:** Hearing loss at higher frequencies is found to be associated with hypothyroid group
Key words: Ear, Hearing, Hypothyroidism

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INTRODUCTION

Since 1400 BC, the appreciation of the clinical manifestations of hypothyroidism has progressed greatly. New symptom complexes and their association with hypothyroidism are still being realized, yet, in many ways the role of thyroid remains poorly understood. One such area concerns the influence of the thyroid gland on hearingand the inner ear.[1, 2] There are both clinical and laboratory evidences that hypothyroidism produces derangement inthe hearing and vestibular system. Thyroid hormone deficiency may lead to severe cognitive dysfunction and deafness. Hypothyroidism is a cause of genetic and environmentally induced deafness. Although many authors have reported hearing loss in hypothyroidism, there is still no clear understanding on its pathology.[3, 4] The real incidence of hearing loss in patients with hypothyroidism is not known clearly yet; however, it has been reported that 25% of the patients with acquired hypothyroidism and 35-50% of those with congenital hypothyroidism may have hearing loss.[4, 5]Hearing loss has been reported to be associated with thyroid disorders and treatment with propylthiouracil.[6] Hence; we undertook the present study to assess the origin of hearing loss in hypothyroid cases.

MATERIALS & METHODS

The present study was conducted in the department of Medicine and ENT of Balbir Hospital, Faridkot and included assessment of 60 patients who reported with the chief compliant of hypothyroidism and were undergoing treatment for the same for past minimum of 1 year. The present study included assessment on 60 control subjects which were assessed and compared with the patient group. All the patients were divided into two study groups. Group 1 comprised of the patient group while Group 2 comprised of the control subjects. Control groups were formed by re-evaluating the patients in Group 1 and 2 with audiology tests during the hypothyroid period. Written consent was obtained from the patients after explaining in detail. Exclusion criteria's were refusing to visit the ear-nose-throat polyclinic for the hearing tests, not giving consent to participate in the study, having an autologic disease/surgery, mechanical trauma, syphilis, malignancy, vascular disease, acute or chronic otitis media, congenital cochlear malformation or neurological disease (knowing cause of hearing loss), using autotoxin drugs within the 1-month prior to the study, having hypertension or etiological factors such as liver or renal failure causing hearing loss and receiving

radiotherapy or chemotherapy treatment within 1-month prior to the study for any reason. Patients having fT3 and fT4 levels below the normal value were regarded as clinic hypothyroid and included in the study. Those with serum TSH levels below the normal value (<4.94 µIU/ml) but having normal fT3 and fT4 levels were regarded as subclinic hypothyroid and excluded from the study. All the patients underwent high-frequency audiometry and hearing tests with TEOAE (in pretreatment and posttreatment euthyroid periods) performed by a single audiometrist (VO).A response (better hearing than 30 decibels) to TEOAE was shown as "PASS" on the screen while no response (hearing loss range was 30 decibels or more) was shown as "REFER". All the follow-up records were recorded and analyzed with SPSS software. Chi-square test and student t test were used for the assessment of level of significance. P-value of less than 0.05 was considered as significant.

RESULTS

Table 1 and Graph 1 show the pre-treatment and post-treatment hearing thresholds of Group 1 at different frequencies. The mean threshold of hearing at 250 frequencies in group 1 at pre-treatment and post-treatment time was 18.9 and 18.01 dB respectively. Significant results were obtained while comparing the mean thresholds at pre-treatment and post-treatment time at 4000 Hz and higher frequency. **Table 2 and Graph 2** shows the pre-treatment and post-treatment hearing thresholds of Group 2 at different frequencies. Significant results were obtained in comparing the mean threshold in group 2 at pre-treatment and post-treatment time at frequency of less than 2000 Hz.

Table 1: Pre-treatment and post-treatment hearing thresholds of Group 1 at different frequencies

Frequencies (Hz)	Pre-treatment	Post-treatment	p-value
250 Hz	18.9	18.01	0.25
500 Hz	12.52	15.87	0.41
1000 Hz	12.55	12.11	0.33
2000 Hz	13.01	13.28	0.71
4000 Hz	18.02	21.33	0.01*
6000 Hz	23.15	25.76	0.01*
8000 Hz	27.12	31.55	0.01*
12000 Hz	0.40	44.59	0.01*

Graph 1: Pre-treatment and post-treatment hearing thresholds of Group 1 at different frequencies

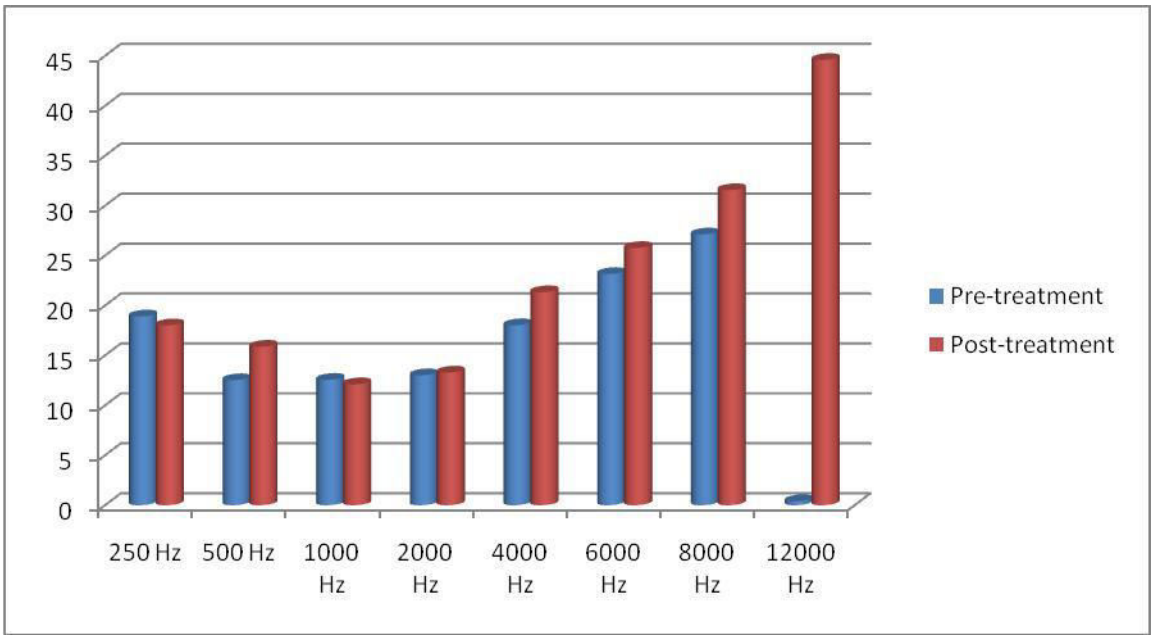
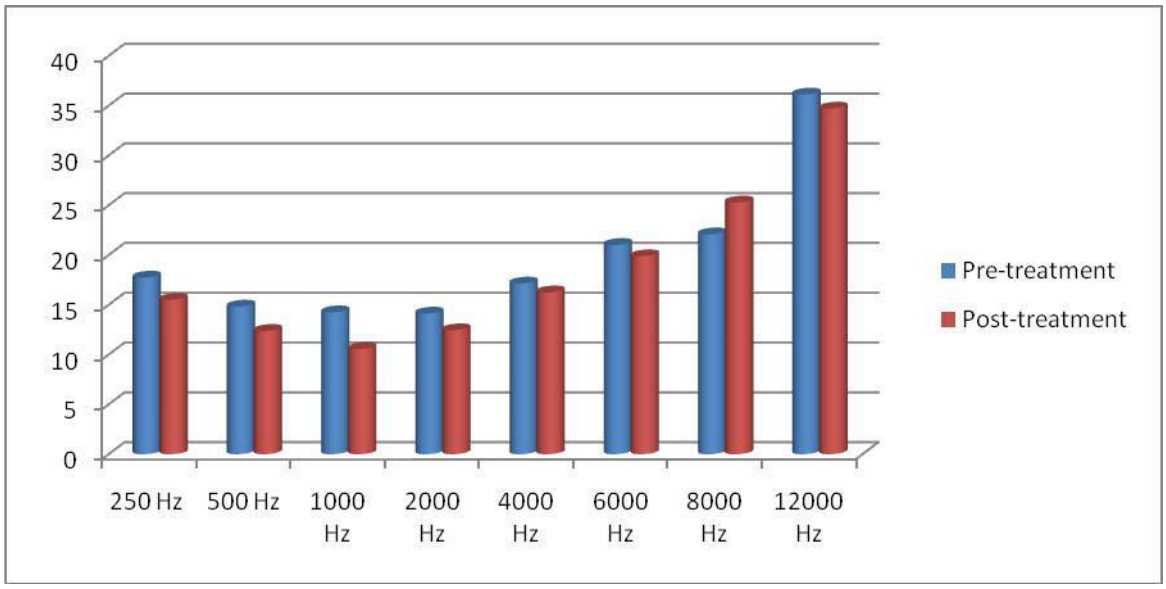


Table 2: Pre-treatment and post-treatment hearing thresholds of Group 2 at different frequencies

Frequencies (Hz)	Pre-treatment	Post-treatment	p-value
250 Hz	17.74	15.51	0.01*
500 Hz	14.82	12.38	0.01*
1000 Hz	14.25	10.57	0.01*

2000 Hz	14.12	12.45	0.01*
4000 Hz	17.14	16.25	0.36
6000 Hz	21.01	19.88	0.55
8000 Hz	22.08	25.28	0.57
12000 Hz	36.12	34.71	0.71

Graph 2: Pre-treatment and post-treatment hearing thresholds of Group 2 at different frequencies



DISCUSSION

One of the most important dysfunctions of the thyroid gland is hypothyroidism (congenital or acquired) in which the production or function of thyroid hormones is impaired, resulting in generalized reduction of the metabolism of all the systems. Hypothyroidism affects 2% of adult women and only 0.2% of men.[8, 9] Auditory acuity reduction has been associated with thyroid gland dysfunction and has been described by numerous authors. In 1974, Ritter stressed that hearing loss can be the most common otorhinolaryngological manifestation of congenital and acquired hypothyroidism, and auditory symptoms may happen alone or in association with vertigo and tinnitus.[10] The real incidence of hearing loss in patients with hypothyroidism is still uncertain, and it may affect 25% of the patients with acquired hypothyroidism and 35-50% of the patients with congenital hypothyroidism.[11] Hence; we undertook the present study to assess the origin of hearing loss in hypothyroid cases.

In the present study, we observed that among hypothyroid patients, in approximately 12 percent of the study population, mild hearing loss was detected in the pre-treatment phase while in approximately 13 percent of the population mild sensorineural hearing loss was present in the post-treatment period. Santos et al studies the audiological evaluation of patients with acquired hypothyroidism. Two groups were included: a hypothyroidism group (HG, n-30), and a control group (CG, n-30). Parameters studied: gender, time of hypothyroidism, comorbidities, cochleovestibular symptoms, biochemistry and hormonal exams (TSH, T4), tonal audiometry, TOAEs and BERA. Sensorineural hearing loss was detected in 22 ears from the HG and in seven from the CG. BERA was normal in the CG and altered in 10 ears from the HG, showing L-V increase. TOAEs were absent in 12 ears from the HG and in four from the CG. HG patients had more cochleovestibular symptoms, higher audiometric thresholds, increase in L-V in the BERA and absence or reduction in TOAEs amplitudes.[12]

Hoth et al assessed inner ear hearing loss by means of evoked otoacoustic emissions (EOAE) is already established in practice. EOAEs werde measured and analysed in 240 ears with sensorineural hearing loss (excluding cases with conductive and retrocochlear disorders) of 120 patients using ILO88/92 equipment with standard test conditions. A significant negative correlation is found between the amplitude of TEOAEs and the average hearing loss in the range of 0.5 to 4 kHz. The sharpness of the transition between clear responses and absent responses decreases with increasing age. Therefore, the combination of TEOAE and DPOAE recording with the purpose of hearing threshold assessment is especially useful in young patients.[13] Zwirner et al determined incidence, onset, and characteristics of hearing loss in children with mitochondrial encephalomyopathies and to investigate a possible correlation between the degree of hearing loss and neurological symptoms. From August 1992 to September 1998, 29 patients ranging in age from 5 to 23 years (mean years) were studied. These children were

hospitalized for diagnostic purposes in the neuropediatric department. The mitochondrial disorder was diagnosed by clinical and laboratory testings, including analysis of the mtDNA. Audiological evaluation consisted of measurements of pure-tone and speech audiometry, tympanometry, and acoustic refle- threshold testing, auditory brainstem response, and evoked as well as distortion-product otoacoustic emissions. A sensorineural hearing loss was identified in 12 children.[14]

Aslan et al analyzed twenty-four consecutive cases of Behçet's disease and 24 sex- and age-matched controls were included in this study. Pure tone and high frequency audiometric tests were performed and pure tone average hearing thresholds calculated for both groups. Transient evoked otoacoustic emission testing was also performed. Pure tone audiometry showed a sensorineural hearing loss in 15 of the Behçet's disease ears. Hearing thresholds were significantly higher in the study group than in the control group, on both pure tone frequency (except 0.5 kHz) and high frequency audiometry. Significant reductions in transient evoked otoacoustic emission amplitude were found at 1.4 and 2 kHz in the Behçet's disease patients. There were no significant differences in reproducibility, stimulus intensity or stability, comparing the Behçet's disease patients and controls. Significantly lower mid-frequency amplitudes were found in Behçet's patients on transient evoked otoacoustic emission testing.[15]

CONCLUSION

From the above results, the authors concluded that hearing loss at higher frequencies is found to be associated with hypothyroid group. However, future studies are recommended.

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