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Hearing impairment in leprosy patients on multidrug therapy

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Abstract

Aims and Objective: Present descriptive study was carried out for the assessment of hearing capability in patients suffering from leprosy.

Material and Methods: After obtaining approval from Institutional ethical committee the present descriptive study was carried out on 60 subjects. All the patients were admitted at the Leprosy Rehabilitation Center Maharogi Sewa Samiti Anandvan Warora, and were on multidrug therapy described by World Health organization for an average period of 6 months.

Group I consisted of 30 leprosy diagnosed patients who were taking multidrug therapy for an average period of 6 months.

Group II control group consisted of age and sex matched 30 normal healthy volunteers. Patients suffering from acute or chronic ear discharge, presence of wax in External auditory canal, diabetes mellitus, hypertension, impaired renal function and patients having history of trauma were excluded from the study. All the subjects underwent Pure tone audiometry, Tuning Fork test to check the level of hearing loss and type of hearing loss and detailed clinical examination for cranial nerve function

Results: Audiometry findings in leprosy patients showed that 75% of the ears in leprosy patients had sensory neural hearing impairment (45 ears), Out of these affected ears 31.66% had mild sensory neural hearing impairment (19 ears), 33.33% had moderate sensory neural hearing impairment (20 ears), 6.66% had moderate to severe hearing impairment (04ears), 3.33% had severe sensory neural hearing impairment (02ears) and 25% showed normal hearing.

Conclusion: In the absence of any local or systemic disease or drugs likely to have side effects on the cochlea-vestibular function, leprosy affects the cochlea-vestibular system and cochlear effect is seen more often than effect of the vestibular system. Thus hearing loss which is seen in leprosy is of cochlear origin.

Key Words: Leprosy, Audiometry, Hearing impairment.

Introduction

Leprosy is a systemic disease which has a predilection for involving the skin, peripheral nerves and mucosa of the upper respiratory tract including the nasal mucosa. Due to upper respiratory tract involvement, there is a possibility of ear involvement [1]. Earlier it may be presumed that the audio-vestibular system may be similarly affected. Any involvement of middle ear, internal ear or vestibule-cochlear nerve will cause a change in hearing. Fifth and seventh cranial nerves and central nervous system involvement in leprosy have been previously reported [2,3]. Alternatively vestibule-cochlear nerve being sensory in nature could also be involved directly leading to hearing loss in leprosy patients [4].

Although skin patches are often the first sign of leprosy, many other diseases can cause similar patches. Only when there is a loss of sensation inside the skin patch, as compared with the skin surrounding the patch, we can be sure that the person is suffering from leprosy. The diagnosis of leprosy is mainly based on the clinical signs and the symptoms of the disease [5]. Trained leprosy health workers can easily observe and recognize these features.

In an endemic country or area, the following two cardinal signs should make an individual suspect of suffering from leprosy: 1. skin lesion consistent with leprosy and with definite sensory loss, with or without thickened nerves. 2. Positive skin smears. The classification of leprosy is based upon 2 basic criteria that are, the clinical manifestations and the results of skin smears. However, skin smear services are not generally available [6]. The clinical classification of leprosy, for the purpose of treatment, is based on the number of skin lesions and nerves involved. Leprosy is classified into pauci-Bacillary (PB) in which patients should have up to 5 skin patches, while people with Multi-Bacillary (MB) leprosy must have more than 5 skin patches.

Hearing loss, which is a natural consequence of old age (Presbycusis),

can either be conductive or sensory neural. Some people suffer from both, which is called mixed hearing loss. In view of the conflicting reports on the subject, the present study was undertaken to evaluate the audio-vestibular status in leprosy patients.

Material and Methods

After obtaining approval from Institutional ethical committee, the present study was carried out on 30 leprosy patients and 30 normal, healthy volunteers. The subjects were divided into 2 groups:

Group I: consisted of thirty patients. Out of these, 29 patients were clinically diagnosed as Multi-Bacillary (MB) and 1 patient was diagnosed as Pauci-Bacillary (PB) leprosy. All the leprosy patients were admitted at the Leprosy Rehabilitation Center Maharogi Sewa Samiti Anadvan Warora and were on multidrug therapy described by World Health organization for an average period of 6 months.

Group II: control group consisted of 30 normal healthy patients of the same age, sex and socioeconomic status of the patients in group I.

Patients having history of chronic or acute ear discharge, Presence of wax in External auditory canal, diabetes mellitus, hypertension, impaired renal function and patients having history of trauma were excluded from the study.

Pure tone audiometry test was performed on all the patients to assess the level of hearing and hearing loss in a soundproof audiometry room. Both air conduction and bone conduction threshold were obtained. Pure tone audiometry also helped for type and degree of hearing loss. Pure tone audiometry was done by using a clinical audiometer ALPS-Advance digital Audiometer Model AD 2000. Pure Tone Audiometry is the most common technique used for hearing assessment. Pure tones are delivered to the ear through headphone for air conduction and bone by vibrator for bone conduction. The frequency tested usually range from 250 to 8000 Hz.

Interpretation of audiogram: The pure tone average is the average of the hearing threshold level at 500, 1000 and 2000 Hz only. The deafness can be graded into several categories by air conduction threshold. 0 to 25 dB - Normal hearing, 26 to 40dB- Mild deafness, 41 to 55 dB- Moderate deafness, 56 to 70 db - Moderate to severe deafness, 71 to 90 db - Severe deafness and above 90 db - Profound deafness.

Tuning Fork Test - Also helped in determining the type and degree of hearing loss that is conductive type or sensory neural type of deafness (Tuning fork of 256 Hz, 512Hz and 1024Hz were used). Detailed clinical examination for cranial nerve function and Fifth nerve function were tested by examination for loss of sensation over the face and diminution or

absence of corneal reflex. The integrity of the seventh nerve was tested by examining voluntary facial movement and acoustic reflex.

Results

The study subjects included 15 males and 15 females with a mean age and SD of $46.3 + 17.06$ years (**Table 1**). The average disease duration in these patients was 14 months and the average duration of treatment taking was 6 months. All the findings of the study group and the control group were tabulated and correlation of the audiometric findings was made. All analyses were performed with SPSS (17.0 Version). The Independent "t" test was used. Comparisons were considered significant at $p < 0.05$.

In present study overall audiometric findings (60 ears) of leprosy patients showed that 75% of the leprosy patients had sensory neural hearing impairment (45 ears), Out of these affected ears 31.66% had mild sensory neural hearing impairment (19 ears), 33.33% had moderate sensory neural hearing impairment (20 ears), 6.66% had moderate to severe hearing impairment (04 ears), 3.33% had severe sensorineural hearing impairment (02 ears) and 25% showed normal hearing (**Table 2**).

The mean audiometric value of study group (60 ears) was 38.85 ± 14.97 dB and for the control group it was 29.08 ± 2.52 dB. When these values are compared there was significant difference with p-value of 0.000. The mean audiometric value for right ear of study group (30 ears) was 35.28 ± 14.68 dB and for the control group right ear it was 28.82 ± 2.83 dB showing significant difference with p-value of 0.0214. The mean audiometric value for left ear of study group (30 ears) was 42.41 ± 14.64 dB and for the control group left ear it was 29.34 ± 2.18 dB showing significant difference with p-value of 0.001 (**Table 3**).

| Sex | Number of Patients | Mean age in Years with Stander Deviation (+) |
|--------|--------------------|----------------------------------------------|
| Male | 15 | $39.2 + 15.93$ |
| Female | 15 | $53.4 + 15.53$ |
| Total | 30 | $46.34 + 17.06$ |

Table 1: Distribution of Age/Sex in Study Patients

| Severity of deafness | Audiometry Range | Number of Ears affected Out of 60 | Percentage of Involvement |
|----------------------|------------------|-----------------------------------|---------------------------|
| Normal | 0-25dB | 15 | 25% |
| Mild | 26-40dB | 19 | 31.66% |
| Moderate | 41-55dB | 20 | 33.33% |
| Moderate to Severe | 56-70dB | 4 | 6.66% |
| Severe | 71-90dB | 2 | 3.33% |

Table 2: Severity of deafness in leprosy patients

dB Decibel

| Variant | Group I | Group II | Compression (p-value) |
|-------------------|---------------|--------------|-----------------------|
| Right ear 30 (dB) | 35.28 +14.68 | 28.82 + 2.83 | 0.0214 |
| Left ear 30 (dB) | 42.41 + 14.64 | 29.34 + 2.18 | 0.001 |
| Total ear 60 (dB) | 38.85+ 14.97 | 29.08+ 2.52 | 0 |

Table 3: Audiometry Finding

Group-I: Patients suffering from leprosy and taking treatment.

Group-II: Control group.

dB Decibel

Discussion

Other than the fifth and seventh nerves, reported cases of cranial nerve involvement in the literature are rare, with only a few documented cases of the eighth cranial nerve involvement [7]. It was also observed that Eustachian catarrh was detected quite frequently in lepromatous leprosy and postulated that it was responsible for the diminution in hearing acuity which was detected in 28.3% of the cases [8].

The relationship between hearing loss and leprosy was not thought until Decandio and Marino, 1960 [9] recorded a specific involvement of cochlea and acoustic nerve in leprosy patients. Sacheri et al detected a high incidence of hearing loss in patients suffering from leprosy [8]. However, Cochrane and Devey [10] 1964 stressed that the 8th nerve is never affected in leprosy. Usmanov et al. observed vestibular involvement in only 3% of leprosy patients [11,12]. In another study, Usmanov et al.

[13] reported 61% of perceptive type of deafness in leprosy patients. Abodel Latif 1967 reported sensoryneural hearing loss in 25% of leprosy patients [14].

Schuring and Istre 1969 did not observe any effects on the middle or inner ear [15]. El Arini et.al. 1970 reported gradually progressive perceptive deafness and vestibular dysfunction in leprosy patients due to cranial nerve involvement [7]. Jaffe 1971 stated that specific leprosy changes of the inner ear and the eighth nerve are not known [16]. Luley and Gulati 1977 reported perceptive deafness in 40.6% of ear in leprosy patients [17]. Singh et al 1984 reported impaired hearing in 52% of Leprosy patients [1]. Mann et al 1987 reported that 44% of leprotic patients suffered from unilateral or bilateral perceptive deafness [18]. Awasthi 1990 found audio-vestibular involvement in 16% of Leprosy patients [19].

M.Koyuncu et al., 1994 found sensory neural hearing loss in 22% of leprotic patients and vestibular dysfunction in 11% of the patients [20]. Ramadan 2001 observed a higher frequency of cochlear nerve impairment in leprosy patients [3]. Gopinath 2004 in his study reported that auditory nerve involvement was seen in 10% of Leprosy patients [21]. Sudhir Kumar 2006 noted multiple cranial nerve involvement in 44% of patients with leprosy but audiometric testing was not performed in this study [22]. Giselle, Mateus da Silva et.al, 2008 found that 8.75% of leprosy patients suffer from hypoacusis [23]. Aejaz Ali Wani 2009 reported that only 3% of leprosy patient showed auditory nerve involvement [24].

In present study overall audiometry findings (60 ears) of leprosy patients showed that 75% of the leprosy patients had sensory neural hearing impairment (45 ears). On the contrary to our findings is the study conducted by Mann et al. [18] and Singh [1] who reported hearing impairments in 52% and 44% of their patients respectively.

Ototoxicity is a side effect caused by a number of drugs. These include antibiotics, diuretics, beta blockers, anticonvulsants, cytotoxic drugs and depot steroids. The Index Hand book of ototoxic drugs includes almost every group of drugs [25]. The side effects of major anti-leprosy drugs, like dapsone, clofazimine and rifampicin, are the manifold but ototoxicity has not been recorded in the literature [26]. The study conducted by Awasthi [19] also failed to reveal any adverse effect of these drugs on the hearing status and the vestibular function even after 1 year of therapy.

This suggests that hearing may be impaired due to the eighth nerve involvement in leprosy without any relation to the age of the patients or the duration of the disease. In the present study as much as 75% of ears in leprosy patients were suffering from perceptive loss of hearing. This percentage is rather high and shows the great tendency of the leprosy to cause damage of the 8th cranial nerve. This is in contrast to what has been previously reported in the literature.

Conclusion

In the absence of any local or systemic disease or ingestion of drugs likely to have side effect on the vestibulo-cochlear function, leprosy affects the vestibulo-cochlear system and cochlear involvement is seen more often than the involvement of the vestibular system. Hearing loss in leprosy patients is of cochlear origin.

Involvement of the eighth nerve alone without any changes in its terminal fibers in the inner ear, or its central connections in the brain stem, is perhaps due to the fact that leprosy bacilli damage the Schwann cell enveloping the individual nerve fibers and not the naked axons or brain tracts. When the eighth nerve is involved, it is probably due to ischemia of the nerve which leads to gradual destruction of axons and ultimately hearing loss.

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