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HEARING ACUITY OF DENTISTS

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ABSTRACT

An air conduction hearing test, in conjunction with a questionnaire concerning noise exposure and hearing problems, was administered to 1216 dentists attending the ADA meeting in Chicago. Within the groups showing hearing loss probably due to noise, avocational noise exposure played a significant role. Despite the recommendation of the Council for Dental Materials and Devices, only 3% of the dentists surveyed wore any protective hearing device.

The following report is based on data from the Health Screening Program of the ADA annual session in Chicago. This study was a cooperative effort between the staff of the Association/Health Foundation and the U.S. Army Institute of Dental Research. The assistance of Dr. John J. Hefferren, Director, Research Institute, American Dental Association Health Foundation, is gratefully acknowledged.

HEARING ACUITY OF DENTISTS

Among the many pollutants with which modern society must cope is noise. Urban man exists in a cacophony of sound. Its influence on hearing has made stringent guidelines necessary within both industry and government in those areas where noise levels are a health hazard. Within the dental environs, the advent of the air turbine handpiece has added to this problem and led to concern within the profession as to its effect on hearing.

In an attempt to assess the effects of dental equipment noise, studies have been conducted since the early sixties.[1-7] Schubert and Glorig[1] concluded that "while temporary threshold shifts may occur they cannot be considered as constituting a hazard to hearing." Temporary threshold shift is a phenomenon related to short, loud noise periods which may produce a temporary loss of some hearing sensitivity. Taylor, Pearson and Mair,[2] however, found a statistically significant decrease in permanent hearing threshold among 40 Scottish dentists after a median exposure of 3.7 years to air turbine drill noise when compared to 11 dentists and 29 male teachers who had not been so exposed. These changes occurred in the 4,000 to 6,000 Hz range, the frequency range produced by many such air turbines. These findings were supported by Keller.[3] Conversely, Hopp[4] showed no change in a group of 61 dental students following 23 weeks of training in the use of an air driven handpiece. This result, however, may reflect the relatively short time frame of the study. For example, a two year study of dental students by Skurr and Bulteau[5] showed hearing loss in four of seventeen students who initially

were considered to have normal hearing and further deterioration of hearing among students who had initially exhibited some degree of hearing loss. Ward and Holmberg[6] in a study of Minnesota dentists attending the State Dental Association Convention concluded that although a slight incidence of hearing loss was noted, it was particularly shown by those dentists exposed to gunfire at some point in their lives.

These and other studies prompted a report by the Council on Dental Materials and Devices.[7] This report recommended that preventive measures for noise attenuation be directed in three areas; the use of ear plugs for personal protection, optimum maintenance of rotary equipment, and reduction of the ambient noise level in the operatory. In an attempt to assess current preventive practices and to evaluate the hearing levels among a group of dentists, a survey was conducted at the 1975 annual meeting of the American Dental Association held in Chicago during the period 26-30 October.

STUDY DESIGN:

As part of the ADA Health Survey Program, an air conduction hearing test was performed on all dentists who so desired. Six Belton model 9D audiometers were used in conjunction with six IAC model 250 booths.* The initial portion of this test was a screening exam. Following an otoscopic examination of the auditory canals to confirm patency, each ear was tested at pure tone frequencies of 500, 1000, 2000, and 4000 Hz. If an individual failed to hear any of these tones at 25 dB, the level

*Calibrated in accordance with 1969 ANSI Standard

was immediately raised to 35 dB for the frequencies 500, 1000, and 2000 Hz and to 40 dB for the 4000 Hz and presented again.

An individual was considered to have failed the screening test if he failed to hear any one tone at 35 dB for the frequencies 500, 1000, and 2000 Hz or at 40 dB for 4000 Hz in either ear, or failed to hear any two tones 500, 1000, and 2000 Hz at 25 dB in the same ear. This screening exam was conducted by dental assistant students of College of Lake County who were trained and supervised by an audiologist.*

Individuals who failed the screening test were immediately referred for more comprehensive testing.** This test precisely determined the levels at which pure tones could be distinguished.

Prior to the air conduction test a questionnaire was completed which gathered information concerning noise exposure, hearing problems, or history of otologic pathology. Questions relevant to ambient noise levels in operatories concerned type of heating and cooling, presence of drapes, types of flooring, presence of acoustical ceiling tiles, use of air turbine handpiece or any other noise generating equipment. Personal hearing questions included the use of hearing protective devices either in their practice or while engaging in hobby activities. Finally, other significant noise exposures were questioned. These included hunting, target shooting, rock music, auto racing, bowling, use of power tools, motorcycles, and aircraft or military exposures.

RESULTS:

Analysis of the results for 1216 dentists indicated five distinct

*Mrs. Barbara Murphy, M.A.
**Capt. M. Moul and Mrs. Barbara Murphy, M.A.

groups based on pure-tone audiometric configuration (Table 1). The first and largest of these groups consisted of individuals whose hearing was considered normal by the previously described criteria. The second group was identified by the questionnaire as having a history of non-noise induced pathology. A third group showed the classic pure-tone configuration associated with hearing loss due to the effects of aging (presbycusis). These patterns were confirmed by the age as stated in the questionnaire. The fourth group, those with which the study was most concerned, included those showing the classic "noise notch," i.e. hearing loss only at 4000 Hz, in one or both ears. The fifth and last group showed hearing loss in a pattern that fell between the classic "noise notch" and aging pattern and was therefore labeled "multiple factors."

After placement into these groups, the following observations were made: 1) a statistically significant greater percentage of subjects categorized as Noise Notch and Multiple Factors participated in target shooting and power tool use (Table 2); and 2) a statistically significant greater percentage of subjects classified as Known Pathology and Aging reported that they did not use air turbines in their offices (Table 3). It is interesting that of 1043 who responded to the question regarding the use of ear protection, only 30 reported that they actually wore some type of protective device.

DISCUSSION:

Precise interpretations are not possible due to the limited nature of this study. A specific population of dentists was not sampled and

pure-tone configuration is only one indication of hearing loss etiology. However, several observations can be made. Within the Noise Notch and Multiple Factors groups there appears to be some additional avocational noise exposure, i.e. power tool use and target shooting. This tends to support the findings of Ward and Holmberg[6] and suggests that the temporary threshold shift induced by noise levels in the dental operatory may become premanent shifts due to the accumulative effects of avocational noise exposure. The lower usage of air turbines in the aging group may well reflect a generation gap in training with subsequent differences in equipment preference, while within the Known Pathology group, this may be the result of concern about preventing further hearing loss. It is important to note that despite the urging of the Council on Dental Materials and Devices, less than 3% of the dentists questioned wore any protective hearing device.

While no definite conclusions may be drawn from this study, the data support other studies and suggest that further emphasis be placed on the potential hazards of noise within the dental operatory and the use of ear protection in vocational as well as avocational settings.

TABLE 1

Distribution of Individuals Examined

Group	No. of Subjects	Percentage of Total
1. Normal	930	76.5
2. Known Pathology (Not Related to Noise)	49	4.0
3. Aging	138	11.4
4. Noise Notch	50	4.1
5. Multiple Factors	49	4.0

TABLE 2

Percentage of Individuals by Group Who Used Power Tools

or Participated in Target Shooting

Group	Used Power Tools	Participated In Target Shooting
1. Normal	21.5	9.1
2. Known Pathology (Not Related to Noise)	13.8	9.7
3. Aging	16.9	8.0
4. Noise Notch	37.9*	17.9**
5. Multiple Factors	37.5*	33.3**

*Significant at the 0.0395 level using Chi Square.
**Significant at the 0.0021 level using Chi Square.

TABLE 3

Percentage of Individuals by Group

Not Using Air Turbine Handpiece

		Percentage
1.	Normal	5.4
2.	Known Pathology (Not Related to Noise)	13.3*
3.	Aging	11.4*
4.	Noise Notch	7.1
5.	Multiple Factors	4.4

*Significant at the 0.0336 level using Chi Square

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