Senile dementia of the Alzheimer's type (SDAT) is a chronic and debilitating neuropsychiatric disorder characterized by a progressive decline in intellectual faculties. This insidious disease accounts for at least half of demented patients over the age of 65 years, and is characterized by the presence of large numbers of neuritic plaques and neurofibrillary tangles throughout cortical and subcortical brain structures, including the olfactory bulb, anterior olfactory nucleus, prepyriform cortex, and entorhinal cortex. In light of such olfactory system involvement, we quantitatively examined the olfactory perception of a group of patients diagnosed as having mild to moderately severe SDAT. This article summarizes our findings, which are described in detail elsewhere.

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PROCEDURES AND RESULTS

Thirty-four patients who satisfied stringent criteria for the clinical diagnosis of Alzheimer’s disease were matched to 34 healthy noninstitutionalized control subjects on the basis of age, sex, and ethnic background. The subject details, including the criteria for inclusion in the study, are presented in a principal publication. To assess odor identification ability, all 68 subjects were administered the University of Pennsylvania Smell Identification Test (UPSIT). The SDAT patients were also administered the Picture Identification Test (PIT) to identify those too demented to comprehend nonolfactory aspects of the UPSIT. In addition, 15 of the SDAT patients and an equivalent number of matched controls were administered a single-staircase, forced-choice, phenyl ethyl alcohol odor detection threshold test.

Eight of the SDAT patients evidenced PIT scores < 35, and one was unable to complete the PIT. Thus, their data, along with those of their controls, were excluded from further consideration. The UPSIT scores of the 25 remaining Alzheimer’s disease patients were significantly lower than those of their matched controls (respective median and interquartile range values equaled 17 [13-22] and 32 [26.5-38]; Wilcoxin matched-pairs signed-ranks test, p < 0.001). Only three evidenced scores above their individually matched controls, and only three had scores falling above the 25th percentile of published UPSIT norms. Of those scores that fell below the 25th percentile, nine fell below the 10th percentile. No statistical difference was apparent between the test scores of the Alzheimer’s patients in stage 1 (n = 9) and stage 2 (n = 16) of the disease (Mann Whitney U Test, p > 0.20).

The olfactory deficit was not confined to odor identification ability, as indicated by significantly higher detection threshold values of the Alzheimer’s patients relative to the controls (respective median vol/vol threshold and interquartile range values equaled 10^-2.65 [10^-3.75 - 10^-1.76] and 10^-5.13 [10^-7.50 - 10^-3.88]; Wilcoxin matched-pairs signed ranks test, p < 0.001). As in the case of odor identification, the decreased sensitivity was consistent, with only one patient evidencing a threshold value below its matched control. Similarly, no significant differences in the threshold values were apparent between the subjects in stage 1 and those in stage 2 of the disease.

DISCUSSION AND CONCLUSIONS

These results suggest that Alzheimer’s disease is reliably accompanied, even in its earliest stages, by major alterations in the ability to detect and identify odors. These findings confirm recent brief communications noting odor identification problems in SDAT patients, and demonstrate that olfactory sensitivity, per se, is altered by the disease process. Whether such alterations are the result of the destruction of neural elements within the olfactory system (e.g., by the action of environmental agents such as viruses or toxins) remains to be demonstrated, although it is noteworthy that the olfactory pathway is a major route for the penetration of neurotropic viruses into the central nervous system.

Currently, clinical diagnosis of SDAT in living persons is based largely upon exclusion of other possible diseases, except in the few cases where a definitive diagnosis can be made from brain biopsy. These findings suggest that prudent use of quantitative olfactory testing may be of value in the early diagnosis of this debilitating and widespread disease.
REFERENCES