

James E. Behrendt,¹ M.F.S.

Alzheimer's Disease and Its Effect on Handwriting

REFERENCE: Behrendt, J. E.. "Alzheimer's Disease and Its Effect on Handwriting," *Journal of Forensic Sciences*, JFSCA, Vol. 29, No. 1, Jan. 1984, pp. 87-91.

ABSTRACT: The fact that illness and age can have an effect on a person's writing has been recognized since the principles of handwriting identification were first promulgated. Most of the attention given to this subject, however, has focused on infirmities that cause physical impairment. In contrast, Alzheimer's disease is a disorder that primarily manifests itself as a mental dysfunction. The causes and effects of various forms of senile dementia, and the medications commonly employed in the treatment thereof, are discussed in this article. The focus is on Alzheimer's disease and the effects that may be seen in the individual's writing as the disease progresses.

KEYWORDS: questioned documents, handwriting, Alzheimer's disease

The problem of examining writing of the aged or ill is not new to the document examiner. Indeed, most examiners are well aware of the special problems inherent in such cases. A review of the literature will show that a wealth of information is available on the subject, ranging from Hilton's excellent articles [1,2] covering the general topic to articles dealing with specific illnesses or infirmities [3,4]. Most of the literature, however, emphasizes the physical aspects of the aged or infirm with little consideration given to the influences mental dysfunctions may have on the writing. The purpose of this paper is to explore an area of senility known as Alzheimer's disease and some facets that should be considered when examining the writing of people afflicted with this disorder.

In point of fact, there is no medical term "senility." The medical reference is senile dementia. Because of its common usage, however, the terms senility and senile dementia will be used interchangeably in this text.

Discussion

Most laymen consider senility a condition of old age whereby an afflicted person gradually loses some mental functions, such as memory and awareness, until they reach the point of mental incompetency. Many people consider this a normal and natural consequence of the aging process. It is usually attributed to such causes as cerebral vascular disease, commonly referred to as "hardening of the arteries" or strokes or both. In truth, however, senile dementia is a much more complicated disorder.

Contrary to popular belief, senility is not a normal condition caused by the aging process. It is a brain dysfunction that has many causes. As a matter of fact, vascular disorders (strokes, cerebral vascular disease, and so forth) account for only one fourth of all senile dementia cases [5]. Another 25% are attributable to a variety of other conditions, including

Presented at the Annual Meeting of the American Society of Questioned Document Examiners, Boston, MA, 16-20 Aug. 1982. Received for publication 23 May 1983; accepted for publication 10 June 1983.

¹State police document examiner, Connecticut State Police, Forensic Science Laboratory, Meriden, CT.

adverse drug reactions, brain tumors, thyroid dysfunctions, dietary imbalances, and hydrocephalus [5].

Another common misconception is that senility is an irreversible process. It is widely thought that while the patient may enjoy brief periods of improvement, the general prognosis is one of continual deterioration resulting in eventual complete incompetency. Depending upon the cause of the senile dementia, however, approximately 35% of senility cases attributable to either cardiovascular disease or the other previously mentioned causes are treatable.²

There is another yet unmentioned cause of senile dementia. It accounts for approximately 50% of all senile dementia cases, yet most people, including physicians, are unaware of its existence. It is estimated that it occurs in 2 to 3% of the general population, or approximately 1.5 million Americans. It is referred to as Alzheimer's disease, and is subcategorized as Senile Dementia Alzheimer's Type (SDAT), Alzheimer's Related Dementia, and Alzheimer's disease. Alzheimer's disease is defined as senile dementia occurring in people below age 65, and is also known as presenile dementia. SDAT refers to senile dementia occurring in people 65 and older. The choice of 65 as a dividing age is an arbitrary one [6]. Both diseases are clinically and pathologically indistinguishable [6]. For treatment purposes, and for the purpose of this paper, no differentiation will be made and both disorders will be referred to as Alzheimer's disease. Alzheimer's Related Dementia is defined as senile dementia stemming from other causes, but showing similar symptoms to SDAT and Alzheimer's disease [6].

Alzheimer's disease is characterized by physiological changes in the cerebral cortex. Groups of nerve endings degenerate resulting in the disruption of the passage of electrochemical signals in the brain. These areas of degeneration are referred to as plaques. As the number of plaques grows, they begin to form filaments described as neurofibrillary tangles [5]. It is not yet known what causes Alzheimer's disease; nor is it curable with any known medications; nor can it be positively diagnosed except through autopsy.

Alzheimer's disease can pose an especially complicated problem for the document examiner, especially when it occurs in younger patients. Many people afflicted with the disease will suffer mental degeneration yet remain physically strong and healthy until the later stages of the disease. The writing of these people will many times contain the normal indications of the aged, senile writers, for example, omission of letters, repetition of letters, and improper connection of words, yet show very little loss in writing skill as would normally be expected. Figure 1 is a sample of writing prepared by an Alzheimer's patient in his late fifties. Present in the writing are letter omissions, letter repetitions, and the improper connection of words. The writing, however, remains fairly fluent.

Signatures of Alzheimer's patients also present a special problem. As the disease progresses all patients eventually lose the ability to write, although at what point in the progression of events this occurs will vary with each writer. Just before complete loss of writing ability an Alzheimer's patient will reach a condition where he or she will be unable to write or sign their name on command. If the name is placed before them, however, the patient will proceed to write. It appears that in some instances the patient is unable to write without a model because they are unable to remember the order in which the letters occur. Other patients, however, are unable to remember the construction of the various letters appearing in their name. Those writers falling into the latter category may then use the letter formation(s) appearing in the model for those he/she has forgotten. The document examiner is thus presented with the problem of ascertaining which characteristics in the signature are native to the writer and which have been incorporated into the writing from the model. It is unclear at this point to what extent this transfer of letter formations occurs. It is apparent, however, that this class of writing would have to be approached along the same lines as a guided hand signature. In this instance, however, the assistance is mental and not physical.

It should be stressed again that the document examiner should not necessarily expect any decline in writing skill to accompany the mental decline of the Alzheimer's patient. When

²W. Keckich, Chief of Geriatrics, Institute of Living, Hartford, CT, interview, Oct. 1981.

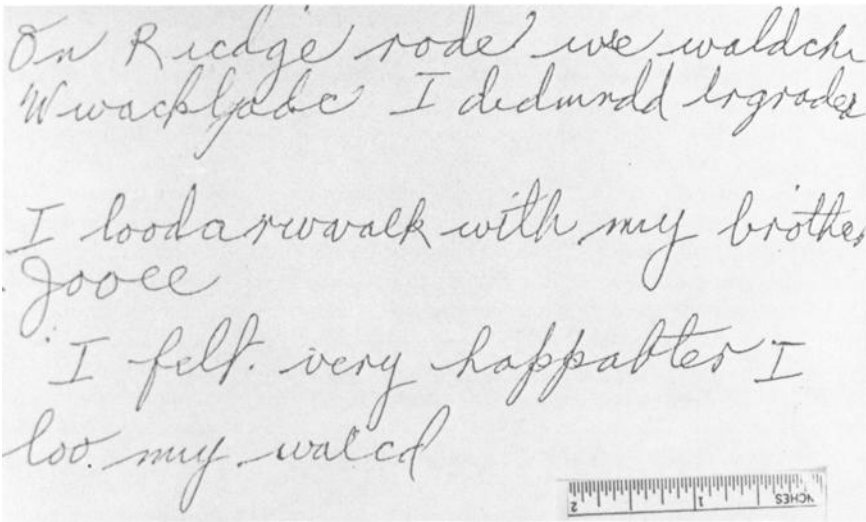


FIG. 1—This is a sample of writing prepared by a well-educated man in his late fifties who is afflicted with Alzheimer's disease. Note the many indications that would normally be associated with aged, senile writers. Of particular interest is the spelling of the name "Joe" on Line 4, the confusion in spelling on Lines 1 and 2, and the improper connection of the words "happy" and "after" on Line 5. 1 in. = 25.4 mm.

the loss of writing skill occurs, however, the writing may degenerate rapidly. Figure 2 illustrates how rapidly the loss of writing skill may occur. The signatures represent the writing of an Alzheimer's patient. The first signature was prepared in 1973 before the onset of the disease. The second signature was prepared approximately nine years later. The disease had progressed to a moderate-to-severe stage. The patient was on medication and confined to a nursing home. The third signature was prepared approximately seven months after the second signature. Note the apparent absence of degeneration in writing skill between the first and second signatures in spite of significant mental deterioration. In contrast, note the severe loss of writing skill in the rather short interval between the second and third signatures.

Medication and Treatment

As every document examiner knows, medications can have an effect on the writing of an individual. Other articles have touched on this problem [7,8], however, because of the variety of symptoms exhibited by Alzheimer's patients and the number of drugs used to alleviate these symptoms, this author feels that a brief discussion is in order. The following is not in any way a comprehensive treatise on the various medications employed in the treatment of this disorder; rather the intent is to highlight some of the more commonly encountered medications.

As the disease progresses, senile dementia patients will undergo emotional and personality changes in addition to suffering increasing cognitive impairment. Some of the typical changes are confusion, depression, irritability, restlessness, anxiety, and agitation [5].³ There are a number of drugs employed to alleviate these symptoms. Note that these drugs do not cure the patient, they merely address the symptoms.

If the patient is experiencing mild forms of restlessness or anxiety, the physician will many times prescribe a mild tranquilizer, usually of the benzodiazepine class [9].² The more commonly recognized of these drugs are Librium® and Valium® [10]. Barbiturates are not normally used as they may cause paradoxical agitation as a side effect [9].

³B. Hugh, Director, Laurus Center, Hartford, CT, interview, Sept. 1981.

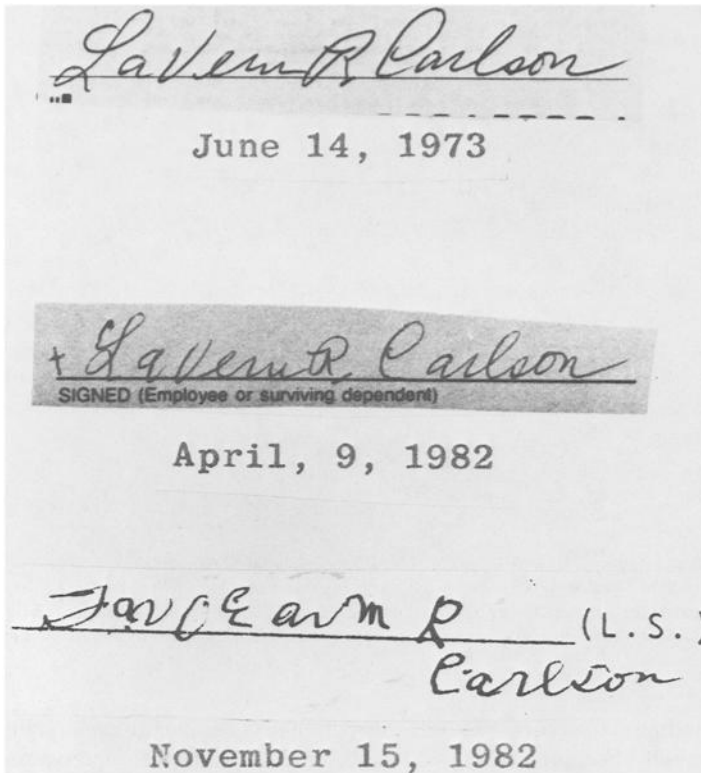


FIG. 2—Three signatures prepared by an Alzheimer's patient over the course of approximately nine years. The top signature was prepared before the onset of the illness. The middle signature was prepared when the disease had reached the moderate-to-severe stage. The patient was under medication and confined to a nursing home. The third signature was prepared approximately seven months after the second signature. Note the fluency of the second signature in spite of the significant mental degeneration that occurred. In contrast, note the rapid degeneration in writing skill in the short interval between the second and third signatures.

If the minor tranquilizers are ineffective, or, in cases of extreme agitation, antipsychotic drugs may be employed [9].² The most commonly used antipsychotics are Thorazine[®], Norazine HCl[®], Vesprin[®], and Haldol[®] [10].² These drugs have the effect of relieving major agitation and restlessness, however, they also can produce some rather severe side effects.

The most common neurological side effects of the antipsychotic drugs are drug-induced parkinsonism or akathisia or both. Akathisia is the inability to sit for any appreciable length of time [10]. For the document examiner the possibility of drug-induced parkinsonism can be of critical importance in the examination as it may serve to deemphasize the importance of the level of writing skill in the examination. For example, if the questioned signature was prepared during a time in which the patient suffered from drug-induced parkinsonism while the standards were prepared at another time when the patient was not so affected, then the apparent discrepancy in writing skill may serve to mislead the examiner.

It should be mentioned that Alzheimer's patients may be administered several drugs over the course of the illness. It is not uncommon for the type of medication to be changed fairly frequently in an attempt to find a drug that gives the maximum desired effect with a minimum of side effects. Each patient and their medical history, therefore, must be treated individually as the type of drug and the order in which they are employed varies. Any possible

side effects stemming from these drugs at any particular stage of the disease, therefore, also will vary from patient to patient.

Conclusions

Alzheimer's disease is not an uncommon disorder. Most examiners, especially those who examine wills and codicils on a regular basis, can expect to encounter it. It is therefore incumbent upon a document examiner to have some knowledge of the disorder and its treatment so that a proper evaluation can be made of any effect the disorder may have had on the individual's writing.

When faced with the problem of examining the writing of an Alzheimer's patient, the document examiner must consider many different factors. Of paramount importance is a knowledge of the patient's medical history, including what medications were being administered at the time in question, and if request writings are supplied, what medications are currently in use. To evaluate properly this information the document examiner must do some research into what the various medications are, how they act, and the possible side effects they may cause. The importance of this information is illustrated by the fact that some patients, because of the agitation they are experiencing, will exhibit some tremor in their writing. Administration of a mild sedative will sometimes alleviate the tremor. Conversely, some medications may introduce tremor into the writing where none previously existed. This is one area where the document examiner cannot afford to be a medical illiterate.

In conjunction with the medical knowledge, it is difficult to underemphasize the necessity for contemporaneous standards. In cases involving later stage Alzheimer's patients, exemplars provided on the day in question are almost a necessity. To extrapolate from noncontemporaneous exemplars is to invite an erroneous conclusion.

Finally, it should be obvious from the previous discussion that cases involving people afflicted with Alzheimer's disease demand the use of extreme caution on the document examiner's behalf. The old tried and true adages about writing of the aged tend to break down. Each case must be treated on an individual basis while keeping uppermost in mind the many influences Alzheimer's disease can have on the writing of an individual.

References

- [1] Hilton, O., "Influence of Age and Illness on Handwriting Identification Problems," *Forensic Science*, Vol. 9, No. 3, May-June 1977, pp. 161-172.
- [2] Hilton, O., "Consideration of the Writer's Health in Identifying Signatures and Detecting Forgery," *Journal of Forensic Sciences*, Vol. 14, No. 2, April 1969, pp. 157-166.
- [3] Beaom, M., "Handwriting of the Cerebral Palsied," *Identification News*, Vol. 18, No. 11, Nov. 1968, pp. 7-8.
- [4] Savage, G. A., "Handwriting of the Deaf & Hard of Hearing," *Canadian Society of Forensic Science Journal*, Vol. 11, No. 1, March 1978, pp. 1-14.
- [5] *Alzheimer's Disease*, NIH Publication 80-1646, U.S. Department of Health and Human Services, Washington, DC, reprinted June 1980.
- [6] Strub, R. L., "Alzheimer's Disease—Current Perspectives," *Journal of Clinical Psychiatry*, Vol. 41, No. 4, April 1980, pp. 110-112.
- [7] Gessell, H. J. E., "Drugs and Questioned Document Problems," *Journal of Forensic Sciences*, Vol. 6, No. 1, Jan. 1961, pp. 76-87.
- [8] Purtell, D. J., "Effects of Drugs on Handwriting," *Journal of Forensic Sciences*, Vol. 10, No. 3, July 1965, pp. 335-346.
- [9] Heil, D. B. "Drugs for Senile Dementia," *Drugs*, Vol. 20, No. 1, July 1980, pp. 74-80.
- [10] *Facts & Comparisons*, J. B. Lippincott Co., Philadelphia, 1982, pp. 261-268.

Address requests for reprints or additional information to
James E. Behrendt
Connecticut State Police
Forensic Science Laboratory
294 Colony St.
Meriden, CT 06450-2098