

BRIEF COMMUNICATION

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Analysis of Ceramic Substrate Found in Cremains

REFERENCE: Huxley, A. K., "Analysis of Ceramic Substrate Found in Cremains," *Journal of Forensic Sciences*, JFSCA, Vol. 39, No. 1, January 1994, pp. 287–288.

ABSTRACT: With the recent increase in the number of lawsuits questioning the possible commingling of cremains, recognition of nonosseous artifacts may aid in the circumstantial identification of a decedent. The remains of a cremated individual were analyzed both macroscopically and microscopically. Examination of material ranging in size from 1.5 cm × 1.0 cm to less than 0.5 cm yielded evidence of numerous nonosseous artifacts. Of primary interest were several fragmentary ceramic objects located in the material, which were pieced together under a microscope and photographed to reveal the imprint of circuitry suggesting a computer chip, subsequently identified from a pacemaker. Although this particular ceramic substrate did not have the necessary markings to facilitate identification of the manufacturer, the pacemaker brand may aid in identification.

KEYWORDS: forensic science, cremains

During the spring of 1991, the Human Identification Laboratory at the University of Arizona held a forensic workshop, during which osseous fragments and nonosseous artifacts from donated cremated remains (cremains) were separated and identified. The objective was to offer students practice in the examination and analysis of such materials.

The cremains were photodocumented, separated using nested standardized 2.38 mm and 595 micron mesh screens, and examined under a binocular stereoscope at approximately 7× to 20× magnification. Analysis of the osseous material produced identifiable bones, and evidence of craniometry as well as porotic hyperostosis on the cranial vault.

Nonosseous artifacts included fragments of firebrick, carbonized material of unknown origin, numerous burned metal fragments, ceramic debris, and unburned straw.

Pieces of ceramic debris were encountered throughout the cremains and these resembled broken porcelain with fine rectilinear designs. In the initial analysis,² the debris was thought to represent the substrate of a pacemaker and all ceramic material greater than 2.38 mm was collected and later pieced together under the microscope using a tape backing to keep the material stationary. It was possible to reconstruct two large separate pieces with this technique (see Fig. 1); however, these two pieces could not be fitted together, but on the basis of the etched design, it was estimated that the object when intact would have measured approximately 3.0 cm × 1.0 cm. The weight of the recovered fragments was 0.95 g.

The metallic debris, some or all of which, could be the remains of a metal shell and

Received for publication 1 March 1993; revised manuscript received 25 May 1993; accepted for publication 26 May 1993.

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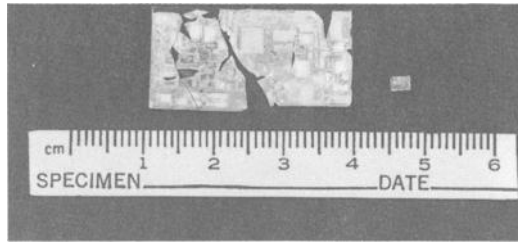


FIG. 1—Reconstructed ceramic object.

the components of a pacemaker that might prove to be unique to a manufacturer. It was believed that a determination of their composition would provide another clue in identification. Thus, the ceramic and metallic fragments were submitted to the Clinical Engineering Department at the University of Arizona where they were identified as possible components of a pacemaker, digital watch, external hearing aid, or an automatic internal cardiac defibrillator.³

Based on this not-too-discreet identification, photographs of the "chip" were sent to various hearing aid and pacemaker companies throughout the United States. Six responses were received, suggesting that the substrate probably was from a pacemaker. The dimensions are too large for a hearing aid, such as internal and behind-the-ear hearing aids, which commonly measure 0.5 cm by 0.5 cm and 1.5 cm by 1.0 cm, respectively, and too small for a pocket-type, external hearing aid. It was further suggested that so complex a design was unlikely to be found in a hearing aid. Telex Communications, Rochester, MN, sent some material common to all hearing aids,⁴ none of which match the metal materials found in the cremains. However, the survivability of these materials in a crematory retort has not been determined. The complex etching and large size certainly suggest a pacemaker substrate; however, the manufacturer cannot be determined unless an etched logo is present on the face of the "chip."

Although this ceramic substrate has never been positively identified by brand and serial number, the size and complexity of design suggest a pacemaker. The use of known pacemaker brands in identification of artifacts may prove useful in future analysis of cremains. Since intact pacemakers with a serial number and logo have been used to identify a decedent during autopsy [1], nonosseous artifacts recovered during analysis can possibly provide essential clues in medicolegal investigation.

Acknowledgments

I wish to thank the biomedical research engineers, who graciously responded to my request for help in the identification of the ceramic substrate. In addition, I wish to thank Dr. Walter Birkby and David Maxwell for comments in preparation of the manuscript.

Reference

- [1] Sathyavagiswaran, L., Selser, S., Ferguson, E., and Danialzadeh, E., "Using Pacemakers to Identify Decedents," *Journal of Forensic Sciences*, Vol. 37, No. 4, July 1992, p. 955.

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