

CASE REPORT

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The Wrong Urn: Commingling of Cremains in Mortuary Practices

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ABSTRACT: Personal identification of human skeletal remains altered by the heat of crematory furnaces in modern mortuaries may be complicated by the presence of more than a single individual in a sample. When identification of cremains of neonates and young children is required in legal disputes, as in cases where relatives suspect that a funeral establishment has presented them with the ashes of another individual, the forensic anthropologist may be consulted by their legal representative.

Problems to be considered in personal identification of cremated bodies are (1) presence or absence of commingled remains in a sample; (2) identification of one or more individuals present. Methods used in sorting and identifying neonate, infant and pre-adolescent remains include reconstruction of stature in situations where long bone diaphyses are preserved, as this may provide evidence of age at time of death, and assessment of dental crown development of unerupted and erupted deciduous teeth also for age determination. These procedures were used in the case reported here concerning mortuary practices of a funeral home and a family claiming that they were presented with the cremains of an adult and not those of their 15-hour-old daughter.

KEYWORDS: forensic science, forensic anthropology, physical anthropology, cremains, commingled bones, cremation practices, neonate skeletons

Readers of Robert Louis Stevenson's *The Wrong Box* (1), published in 1889, will recall how a corpse is unceremoniously carted round in a barrel, transferred to an eviscerated piano, and becomes the property of a pirate fleeing along the Great Haverham Road in a stolen wagon bearing the locked piano with the body bouncing inside. Problems of depositing dead bodies into their proper containers are not confined to late Victorian England, as demonstrated by a recent case of the "wrong urn" with its setting in western New England—another part of the world with a long history of body-snatching, premature burial, commingled corpses and confiscated coffins. However, this case of personal identification involved cremated skeletal remains (cremains) of a new-born infant (neonate) that appeared to have been mixed and put into two separate containers with bones and teeth of another individual—a child of 3.5 to 4 years of age—at a professional crematorium.

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Problems to be considered in cases of personal identification of cremains of neonates and young children when legal action is taken by relatives of the deceased include (1) determination of presence or absence of identifiable bones and teeth subjected to burning at high temperatures; (2) identification of the number of individuals present. Reconstruction of the circumstances whereby commingling of cremains of more than one individual had occurred is the responsibility of other experts in the forensic sciences.

Solutions to these problems are found in the investigative protocol of forensic anthropologists who are becoming aware that commingling of cremains may be a common practice in some crematory establishments. Unless the cremains are pulverized in a final procedure of mortuary treatment, there are usually sufficient osseous and dental materials remaining with the ashes, even after exposure to temperatures over 1500 degrees C (2732 degrees F) in modern crematory furnaces. When cooled and deposited in funerary urns, where they may remain for varying periods of time, identifiable portions of bones and teeth may be preserved.

Case Circumstances

In March 1984, the daughter of a family living in western New England died 15 hours after birth due to complications of both underdeveloped heart and lungs. The parents decided to have the body cremated and scatter the ashes in an Adirondack lake. Arrangements were made with a funeral home to have the infant cremated, as was done at a well established crematorium. When the urn with its cremains was delivered to the family by the funeral home, the father was puzzled that it weighed more than might be expected if containing the ashes of a newborn infant. He opened the urn and found it almost half filled with ashes along with materials he identified as artificial dental crown caps, metal staples, and calcareous globs he believed were kidney stones. Surely these were not the vestiges of his offspring! The funeral home was contacted immediately, and the secretary admitted that a delivery error had taken place and that the right urn would be sent over that very afternoon to replace the opened one. However, the father had a better idea—he engaged an attorney. Certain that he had been presented with the remains of a cremated adult who had suffered from renal problems and had a history of dental work involving capped teeth, family members and their lawyer arranged for a hasty consultation with an employee at a local natural history museum. This person, who had some anthropological training, confirmed their opinion. The cremains examined by the father and museum-staff member are identified as Urn No. 1 in this case; Urn No. 2, which was offered by the funeral home as the one

containing the actual remains of the baby, was rejected by the family and their legal counsel and a suit was filed against the funeral home.

By April 1986, Urn No. 2 was sent by the attorney representing the crematorium and funeral home to the author at the Human Biology Laboratory at Cornell University for identification of its contents. Urn No. 1, which had been inspected and retained by the family of the deceased infant, arrived at Cornell in September 1987 in the hands of a junior member of the legal firm representing the family. The charge of the forensic anthropologist at Cornell was to discover the nature of the contents of both containers, compare the contents of Urn No. 1 with Urn No. 2, and determine if one or both contained the cremains of the 15-hour-old neonate. Separate reports of the laboratory analyses were filed with the attorneys of both legal firms, and the family of the deceased was informed of the findings of the forensic anthropologist. The case was brought to court in December 1988.

Methods and Materials

There is a considerable scientific literature on the subject of burnt skeletal and dental remains authored by paleontologists, archaeologists and forensic anthropologists (2-5). Of course, personal identification of the deceased is neither required nor possible in the course of field research of extinct human populations where the orientation is paleodemographic or bioarchaeological, but many of the procedures for determining age, sex, stature, pathology, ancestral affinity, and nutritional status of earlier peoples are directly applicable to the quest of the forensic anthropologist for personal identification. Taphonomists, who analyze death assemblages of fossil fauna, encounter charred specimens. These may be critical toward understanding butchering and food preparation techniques in cases where the specimens were victims of human predation and scavenging. Archaeologists excavating habitation and mortuary sites want to know if calcined bones indicate burning of fleshed bodies (green bones) or dried bones, such as may be collected by survivors of the deceased in the practice of secondary burial.

Bodies burned in the flesh in an open fire exhibit transverse cracks oriented at right angles to the axes of diaphyses of long bones, while fat-free dry bones exhibit longitudinal striae (6-7). Warping is less apparent in cases of burnt dry bones and more obvious in fat and muscle-encased bones exposed to heat. Bone shrinkage commences at temperatures above 700°C and discontinues at 1100°C. The rate of shrinkage varies with individual bones, for example, 11.56 ± 4.12 mm for an adult human femur and 16.43 ± 4.55 mm for an adult human mandible at 800°C (8).

The color, weight, and surface texture of burnt bone denotes the degree of heat intensity, time of exposure, and location to direct or indirect burning. Thus, yellow or brown bone is the result of low temperatures and retention of body oils, while white bone indicates very high and prolonged temperatures. Total destruction of a adult body by fire is rare, and it never occurs below temperatures reached in modern crematory furnaces. An adult body calcined in a modern crematory furnace may be reduced to about one-half bushel of ash, bone and dental fragments, and with the lower temperatures of open fires in non-crematory conflagrations a considerable amount of human remains may be retained for analysis by the forensic anthropologist (9,10). Positive identification is not precluded in bonfire-type efforts to destroy human bodies.

Within the contents of Urn No. 2 were identified 41 pieces of cranial bone with a size of >3.0 mm and 21 pieces with a size <3.0 mm, four right and two left ribs plus 17 additional rib fragments, and the diaphyses of right and left fibulae, right and left femora, right humerus, right and left radii and left ulna could be identified. Several pelvic fragments were present but there were no dental remains. Given the firing temperature of the specific crematory oven involved in this case as 1093.3°C (ca. 2000°F), the remains were remarkably well preserved. They had a light yellow color, had not been pulverized, and were readily identifiable as those of an infant. A single individual was present and there was no evidence of commingled remains in this urn.

To estimate the age at time of death of the infant, lengths of preserved long bone diaphyses were measured for reconstruction of fetal stature. A Helios dial caliper calibrated to 0.1 mm was used for all measurements. The regression equations of Olivier and Pineau (11,12) were used, the right humeral diaphysis yielding a fetal stature of 35-40 cm. This value corresponds to a crown-rump length of 28-32 cm:

$$\text{Fetal stature} = 7.92 \times \text{humerus diaphysis length} - 0.32 \pm 1.8 \text{ cm}$$

$$\text{Humerus diaphysis length} = 5.42 \text{ cm.}$$

Shrinkage of diaphyseal length = 1.1 mm in the well preserved right femur, hence the extent of bone shortening is not a significant factor in reconstruction of fetal stature for a neonate with a body length under 42 cm (8).

Results

These stature values fall within the mensural range for infants several days old, but not several months old. A large fetus may attain this size in utero, but only during the final weeks of development. A fetal stature of 42 cm and crown-rump length of 29 cm, when compared to fetal growth tables, fall within the age mean of $8\frac{1}{4}$ lunar months (13). Recorded birth weight of the infant in this case history was 3632 g (8 lbs), a value that corresponds with the body size values of a neonate. This age estimate is confirmed by patency of cranial sutures, incomplete epiphyseal union of pelvic and extremity bones, and thinness of cranial vault bones. Thus it appears that Urn No. 2 contained the cremains of a single neonate. There was no duplication of skeletal elements as all remains were consistent with portions of one infant skeleton.

The contents of Urn No. 1 also include a neonate, but commingled with it were bones and teeth of a child approximately 3.5 to 4 years of age. A considerable amount of hardware was present, namely metal clothing snaps, wire brads similar to carpet tacks, and small amorphous hard substances that were melted buttons and calcareous nodules. Examination of the infant remains revealed 10 fragments of cranial vault with thickness measurements that fell within the range of those of the neonate in Urn No. 2. These values of 0.8 to 2.0 mm are too low for an individual more than 6 months of age and are more appropriate to a neonate. Infant postcranial bones included mid-shaft diaphyses of femora and ulnae. No complete diaphyses were preserved, but anterior-posterior mid-shaft diameters of the left femur (3.1 mm) and right ulna (1.6 mm) indicate an age at time of death under one year and well within the mid-shaft diaphyseal diameters of neonates (13).

Supporting evidence of the age of the infant specimen in Urn No. 1 was derived from vestiges of the unerupted deciduous teeth which were represented by crowns developing in the maxillary

alveoli. Root formation is absent in the dentition of newborn individuals. Mammalons appear in a well-preserved unerupted deciduous right upper central incisor crown which, with absence of root development, are characteristic of the human dentition at birth ± 2 lunar months (14). There are no duplications of infant bones in the two urns, and as the age estimations are the same it appeared to this investigator that remains of the same neonate had been deposited in these separate receptacles, Urns Nos. 1 and 2.

The other individual in Urn No. 1 is a child represented by 31 fragments of cranial vault, face and base along with 6 fragments of long bones and 6 teeth of erupted deciduous and unerupted permanent dentition. There is a well developed and fused root of the deciduous right upper canine tooth. The maturity of this tooth is characteristic of that of a child between 3 and 4 years of age (4). A crown cap of an unerupted permanent left lower second molar without root fusion is present, again a characteristic of children of 4 years ± 12 months. Small enamel crown fragments of erupted deciduous teeth are present. Measurement of the thickness of the left parietal bone at the eminence is 1.6 mm, twice the mensural value of the parietal thickness of the infant in Urn No. 2. Measurements of other parietal bone loci yielded thickness values of 2.4 to 2.6 mm, sizes well within the range of children from 3 to 4 years of age. This age estimate is confirmed by measurements of the anterior-posterior mid-shaft diameters of fragmentary femoral diaphyses, a value of 9.7 mm for one femoral section being too high for a neonate but appropriate for a child of approximately 3.5 years of age (13). There are three unfused epiphyses of manual phalanges including the distal end of the second medial phalanx of the right hand with beginning fusion of its epiphysis. The proximal phalanx of the first pedal digit is completely fused, a union that occurs at 2 years of age and is complete 12 months later (13,14). Thus the osteological and dental evidence for the child specimen indicates that death occurred at around 3.5 years of age.

Discussion

After concluding that Urn No. 1 contained commingled remains of a newborn infant with a 3.5-year-old child, and that Urn No. 2 held only neonate remains, how can the report of the father of the deceased infant be explained? What were those objects he identified as kidney stones, artificial tooth crown caps, metal staples, and skeletal fragments of an adult individual?

The irregular masses of hard substances misidentified as products of renal pathology were examined in the laboratory and determined to be calcium carbonate nodules. Such are formed in brick and ceramic crematory furnaces when heat leaches nonorganic components from the oven surfaces. As for the mistaken artificial dental crown caps observed in Urn No. 1, these are identified as the naturally formed enamel crowns ununited with roots of the unerupted permanent dentition of the 3.5 to 4 year-old child. The father of the deceased infant was unfamiliar with normal crown-root development and assumed these natural enamel portions of developing teeth had once capped the dentition of an adult patient of a cosmetic dentist. The metal staples were components of containers holding bodies being prepared for cremation and may or may not have been associated with mortuary equipment used in the treatment of the infant relevant to this case.

What was the evidence that adult bones were present? This misidentification by the father found support from the museum anthropologist consulted by the family and lawyer prior to the trial. The answer to this enigma is found in the opening paragraph of the report of the museum employee who wrote, "Having discovered that these

remains were not his child, he (Mr. ---) had requested that I (the museum employee) examine the material in the canister in order to establish that an adult individual was represented . . ." (15). Thus it was that this person, who was not a professional forensic anthropologist, was placed in a situation where bias could not be eliminated from circumstances of the examination of the cremains. The report goes on to misidentify the child's long bone fragments as adult and to misassign all of the dental evidence to a deciduous dentition belonging to an infant (15).

What are the eternal verities to be learned from this case of the "wrong urn"? Although both urns contained remains of a neonate, positive identification of the remains in one or both urns as the daughter of the family pressing suit in court is not possible. Nor can ancestry (race), sex and markers of individuation be determined from cremains of either the infant or child. The source of the contentions in this case are retrieval of cremains from crematory furnaces of mortuary establishments where commingling of the bodies of the deceased is allowed. Indeed, an employee of the crematorium associated with the funeral home to which the body of the family's daughter was consigned admitted to news reporters that this establishment sometimes cremated infants with older persons as an economic measure. If this is a common practice in modern crematoria, then the forensic anthropologist is well advised to consider the possibility of encountering commingled remains in the course of cremains analysis. Aware of this threat to irregular mortuary procedures, some crematory establishments are pulverizing bones and teeth fragments that remain after burning, the final product being a composit of unidentifiable ash and minute residues of organic tissues.²

The final scene of this case of the "wrong urn" is the trial that took place in the latter part of 1988. The testimony of the museum employee was heard, however the attorney representing the crematorium and funeral home decided one-half hour before the trial not to place the forensic anthropologist from Cornell University

²A copy of this case study was sent to the Corporate Counsel for the crematorium prior to submission of the manuscript for publication. This was done at the request of the author through the attorney who was associated with the Offices of Weidman and Jordan. In a letter dated 1 September 1995 addressed to the latter individual from the attorney from the Corporate Counsel for the crematorium, of which a copy was sent to the author, was an account of the case as it is understood by the crematorium officers and their lawyer. The relevant portions of this communication are as follows:

"The (family name) neonate was cremated by itself, and the cremains of that neonate were placed (by themselves) in a container for delivery to the family. The container was placed on a shelf, but unfortunately was not labeled. In another container in the same area were the cremains of more than one individual, which cremains were to be 'scattered.' It was not uncommon for a 'scatter' container to hold the cremains of more than one individual; but, when cremains were to be returned to a family, those cremains were very carefully segregated, by themselves, into one and only one container. Because both containers were not labeled, the wrong container was given to the undertaker for the (name of family). Thus the mistake was in delivery, not in putting the cremains in the containers. Some confusion may have arisen on the part of Dr. Kennedy, because he apparently found the cremains of another neonate in one of the containers he examined. However, once again, I would state that all of the cremains of the (name of family) neonate were put into one container, that container held only the cremains of the (name of family) neonate, and that container was apparently the one which led to the report by Dr. Kennedy of April 16, 1986. Therefore, we are critical of the article by Dr. Kennedy which suggests that the (name of family) cremains had become mixed and put into separate containers. As a result, we believe Dr. Kennedy is incorrect when he raises a concern about the integrity of the cremains of an individual who may be cremated at (name of crematorium), with the cremains to be returned to the family. Only when the cremains are to be scattered by (name of crematorium) is there a mixing."

This case study reports what was observed by the author in his capacity as a forensic anthropologist, but the account offered by the legal representative of the crematorium on September 1, 1995 becomes an essential part of the record. It does not contain any contradiction of the details of this case study, but adds information unavailable to the author prior to this date.

on the stand. The latter's testimony of commingled remains in Urn No. 1 would have reflected negatively upon the practices of the attorney's client as well as led to a conflict of interpretations by the two persons called as expert witnesses. Thus the assertion that adult bones were present in Urn No. 1 was admitted without contradiction in court (15). Perhaps to the judge and jury it mattered little if the bones of a child or an adult were mixed with remains of a newborn baby since it is obvious that Urn No. 2 was the one that should have been delivered to the family in the first place. Confident that a jury of his peers would support his suit for a considerable amount of money, the father of the deceased turned down an offer for an out of court settlement, then learned to his dismay that the verdict was that he should receive an amount barely covering his legal fees. Furious, he left the court with the admission to reporters that he should have accepted the generous out of court settlement and run!

Conclusions

Taphonomists and archaeologists know that the grave is a restless place where bones escape neither the ravages of Conqueror Worm and his fossorial cohorts nor the consequences of disturbances of the depositional environment due to geological or human agencies. However, the dignified and solid crematory urn suggests a more stable and tranquil abode for the honored dead, until forensic anthropologists shatter this hope. With the realization that commingling of individuals in the same container is an eventuality and that all of our parts may not be consigned to the same receptacle, all of us must face the sobering prospect of sharing eternity in rather close quarters with cremains of people to whom we have never been properly introduced. At best we can hope for congenial companions and that some of us will find ourselves in the "right urn"!

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