

## CASE REPORT

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# Septic Tank Burial: Not Just Another Skeleton in the Closet

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**ABSTRACT:** Backed-up toilets lead to the discovery of a skeleton in the septic tank. Our challenges began with the excavation of this unconventional grave and progressed through recovery and examination of the skeleton, determination of the cause and manner of death, and ultimately, identification of the victim. Main aspects of the septic tank system are summarized, including functional theory, physical design and components, and general comments on use and maintenance. We discuss some basic principles applicable to the excavation and examination of any human skeletal remains, and offer a general approach to identification of the decedent.

**KEYWORDS:** forensic science, forensic anthropology, forensic pathology, septic tank, human skeletal remains, excavation, human identification

The tenants of a duplex house complained to their landlord that their toilets had been backing up for the past week. This initiated a search for the septic tank, which they located approximately 5 ft from the north wall of the house. The concrete tank was covered by six rectangular concrete lids with the entrance drain at the east end, and the exit drain at the west end. The lid was lifted off at the west end next to the exit drain, confirming that the 10 ft long, 4 ft wide, 4½ ft deep tank was filled nearly to the brim with liquid topped by a semisolid gray-black layer of organic scum and scuttling cockroaches. A piece of cloth blocking the exit drain turned out to be a pair of trousers containing a femur in one of the trouser legs.

The police and the medical examiner (author B.G.B.) converged on the scene and deliberated the logistical problems of recovering the body. This unconventional grave presented unique challenges that required innovative solutions. A backhoe removed the remaining five heavy concrete lids on the septic tank. Whatever was visible or palpable in the floating layer of scum was retrieved by (gloved) hand. A commercial septic tank vacuum service evacuated the floating semisolid layer and the underlying liquid component into tanker trucks. As the liquid level subsided, additional

bones and items of clothing were recovered. Below the supernatant liquid, an approximately 2 ft-deep layer of nearly solid residue (sludge) covered the bottom of the tank. Pressurized water sprayed from a fire truck hose into the septic tank fragmented and mixed the compacted sludge into a suspension that was then also vacuumed into the tanker truck. The cumulative 3300 gal of liquid recovered from the septic tank were strained through screens to retrieve small bones and other items of evidence. All portions of the skeleton were radiographed.

Almost the entire skeleton was recovered except for the hyoid bone, one thoracic vertebra, the right ulna, ten carpal bones, one metacarpal, a number of the phalanges of the hands, four phalanges of the right foot, and one patella. The ribs and vertebrae were contained within a short sleeved shirt, and the majority of the bones of the feet were enclosed within a pair of socks inside the shoes. Several distinctive features were noted on the personal effects. The shirt had oval patches on the chest bilaterally. The trouser pockets contained over four dollars in US coins, the most recent being two pennies minted in 1978. A wrist watch encircling the left radius had stopped with the number 20 showing in the date window on the face.

The skeleton had features consistent with a white adult male. Radiographs disclosed tiny radiopaque fragments embedded in the medullary trabeculae around multiple cortical defects in several bones. Projectile fragments recovered from the clothing further supported that death was due to multiple gunshot wounds.

The discovery of the skeleton in the septic tank was broadcast over the local television networks and publicized in the local newspapers. The media attention paid off when a family saw the television coverage and contacted the police. This family was living in the duplex house when the father disappeared suddenly on May 20, 1978. Presumptive evidence of identity was provided by the watch that had stopped on the 20th, the most recent coins dated 1978, and the shirt with the oval patches. Similar patches depicting a business logo were on a shirt worn by the missing father in an antemortem photograph.

Definitive evidence of identity was sought in addition to the supportive presumptive evidence. Unfortunately, no antemortem dental records were available, but several photographs were provided by the family. The old photographs were mediocre quality, and the decedent was smiling reservedly in only one of the six snapshots. That one photograph was computer enhanced and enlarged to facilitate comparison with the dentition in the skull (Fig. 1).

A forensic odontologist documented enough matching points of comparison between distinctive features in the dentition of the

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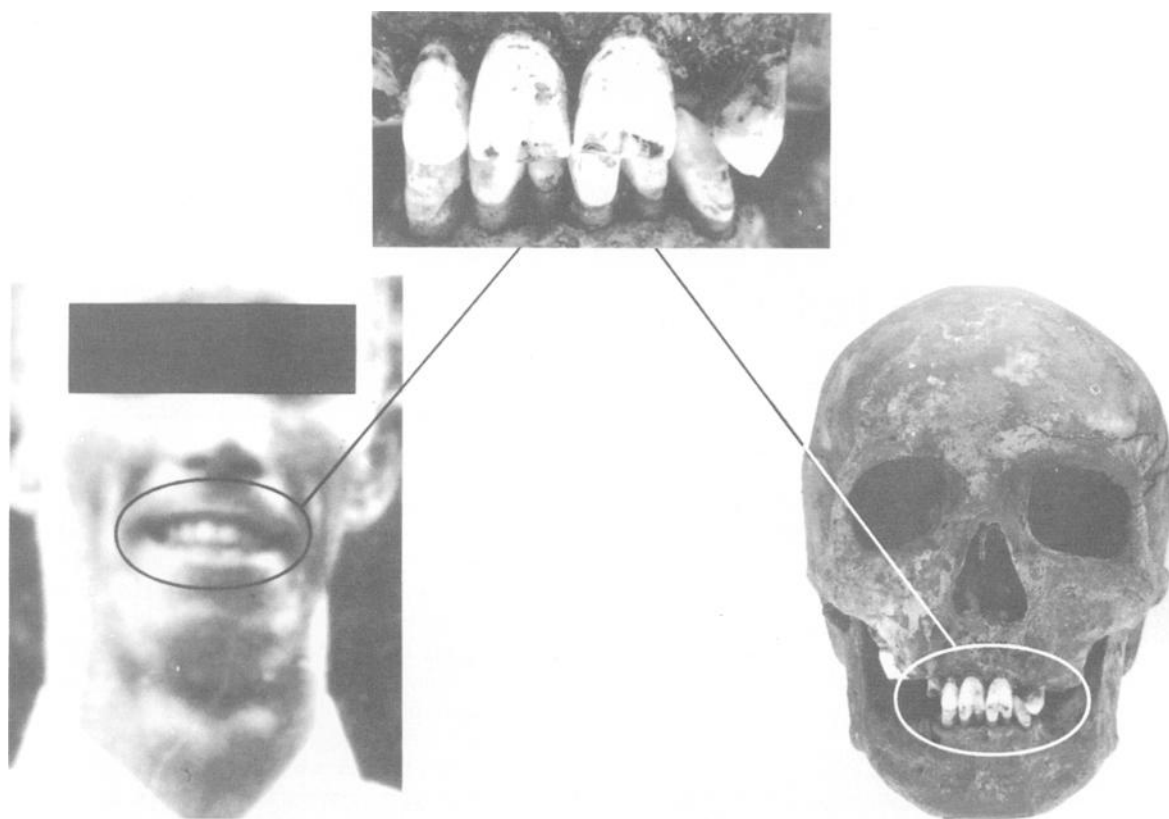


FIG. 1—Identification was established within a reasonable degree of medical certainty by comparing the teeth of the man in the photograph with distinctive features in the dentition of the skull.

skull and the teeth of the man in the photograph to establish identification within a reasonable degree of medical certainty. The missing father, Walter, had finally been found on Thanksgiving Day, 1993, 15½ years after he disappeared.

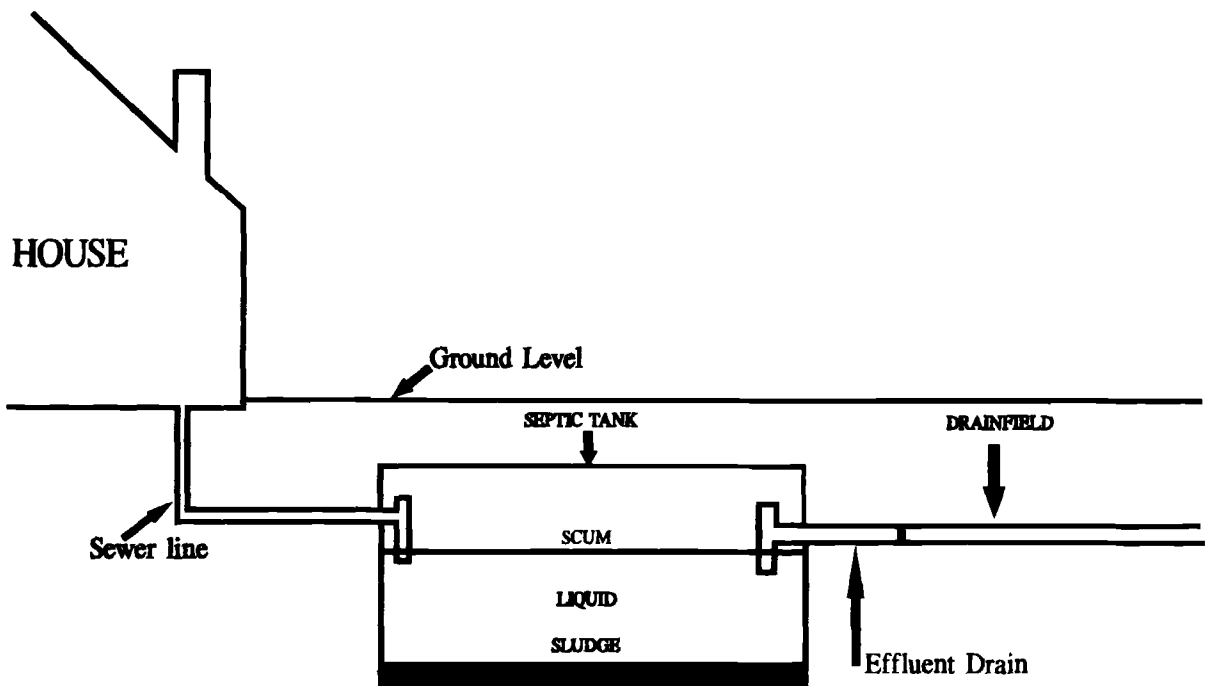
### Discussion

Septic systems are removal and elimination systems designed to take human and other liquid waste products (dish water, bath water), process them, and dispose of them into the soil (1). A sewer line leads from the building to a septic tank, with or without an intervening grease trap (usually for restaurants). Septic tanks are water-tight and relatively air-tight chambers that act as an incubator, allowing anaerobic bacteria, fungi, and actinomycetes to digest organic solids that fall to the bottom. These processes also produce heat and gases that bubble to the surface and combine with fine particles, grease, oils, hair, etc. to produce a foamy scum and, with time, if left undisturbed, a floating semisolid pseudogelatinous mat. Once the tank is filled to a certain level (depending upon the design of the tank), the altered waste products flow out of the tank through an effluent (exit) drain. This drain leads to a series of branching, loosely joined clay pipes or perforated plastic pipes, usually laid out in parallel rows termed a drainfield, also called a leachfield, disposal field, and absorption field (Fig. 2). The drainfield rests on a bed of gravel which is covered with soil and surface vegetation (usually the lawn of the residence), and acts as a biological filter, providing the final step in the treatment of the waste water. Within the drainfield, further aerobic breakdown of organic material can occur. As the effluent waste leaks out of the piping and percolates down through the gravel bed into the

soil, bacteria, viruses, some elements and metals, and other pollutants are removed and adsorbed (2,3). Some of the waste may also be taken up by the root systems of overlying plants where it is lost by evaporation and/or transpiration.

Septic tank care includes regular inspections (every two to three years) and maintenance, as well as knowing what items are inappropriate for disposal into the tank (4). For example, paints, varnishes, thinners, oils, photographic solutions, pesticides, and other organic chemicals can destroy the biological digestive process. Nondegradable solids will fill the tank, decrease its efficiency, and may clog the sewer line, causing backup into the house. Grease and fats solidify and contribute to blockage of lines. As long as human and kitchen waste continues to be flushed into the system, chemical additives and yeast cakes are not necessary to perpetuate the natural bacterial action (5). Although commercially prepared bacteria and enzyme mixtures may improve the digestion process and reduce the amount of accumulated solids (The Clorox Company, Oakland, California, personal communication, 1995), they will not eliminate the need for pumping. Septic tanks should be pumped out or evacuated approximately every two to three years to remove materials such as fats and grease, stones, plastic, and large dense pieces of wood and bone that cannot degrade further. The frequency of pumping will depend on three main factors: the capacity of the tank, the number of people in the household, and the amount of solids in the waste water.

Septic tanks come in a variety of designs and can be constructed of rock, brick, concrete, or fiberglass, and can be round, square, rectangular, or other shapes. The internal design of the tank can also differ, consisting of a single compartment, or two to three



### SEPTIC SYSTEM : top view

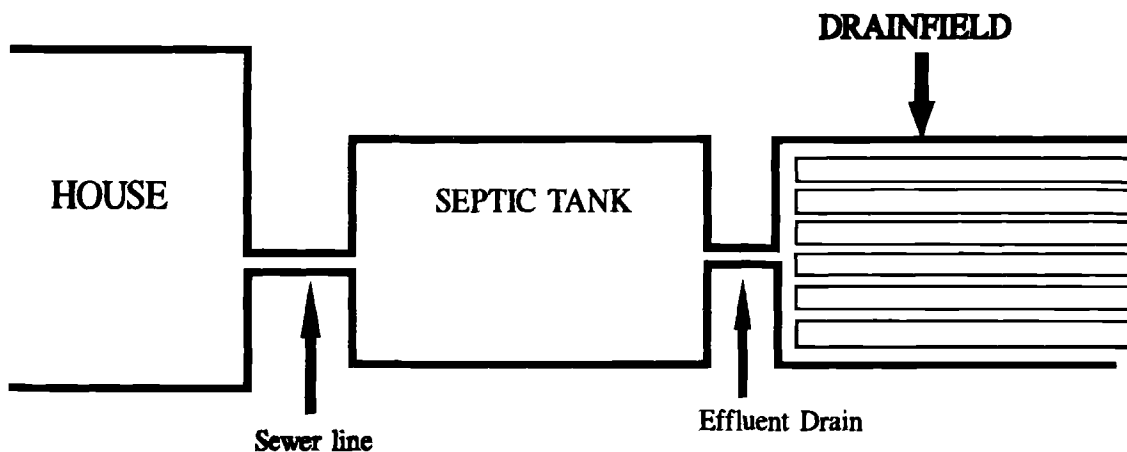


FIG. 2—Side and top views of the septic system.

compartments separated by baffles of incomplete height or full height walls. In view of the multiplicity of septic tank designs, the forensic examination of any septic tank should begin with complete exposure of the surface of the tank, followed by removal of all lids to ascertain the tank design and verify the number of chambers. This will prevent scenarios where, for example, only one chamber is excavated, out of three chambers actually present.

Some bones were not recovered during our excavation, despite complete emptying of the septic tank. Because the tank had never once been pumped out during the entire 15½ years, the missing bones were probably flushed down the drainfield and/or destroyed

by the degradative environment within the septic tank. The clothing and shoes recovered from the tank survived relatively intact for the one and one-half decades of watery entombment probably because of the predominant synthetic nature of their composite materials.

Distribution of the skeletal parts within the septic tank was not random. Initially, the body likely sank to the bottom of the septic tank, as a body would tend to do in nonsalt water. Once putrefactive decomposition had resulted in adequate gas formation in the tissues, the body would have resurfaced, becoming entrapped in the floating layer of organic scum. As a floating body decomposes,

the dangling dependent portions, specifically, the head, arms and legs, may detach and drop away (Dr. William Maples, personal communication, 1995). Consistent with the above, the skull and mandible, bones of the upper extremities, including the scapulae, and the bones of the lower legs and feet were submerged in the liquid contents of the tank, whereas, the axial skeleton, clavicles, and femora remained in the floating layer of scum.

An interesting feature distinguished portions of the skeleton recovered from different areas of the septic tank. Those bones retrieved from the semisolid layer of organic scum floating at the top of the tank were poorly preserved, and had cortical defects that exposed the underlying medullary trabeculae. The floating layer of scum kept those bones buoyant and exposed to the atmosphere, allowing the degradative processes associated with oxidation to erode the cortical surfaces. Bones submerged in the liquid contents of the tank beneath the organic layer were more intact and relatively better preserved despite the ongoing anaerobic degradation.

Versatility, creativity and common sense are enhancing attributes in the practice of forensic pathology. "We did what we had to do, to get the job done" including the use of a backhoe, usually taboo in most excavations. This case reinforced some basic principles important in the investigation of buried/covered human skeletal remains. A thorough, methodical excavation should be performed, with meticulous documentation of all aspects of the procedure, including inventory of items recovered and their location within the grave. One of the main objectives of recovering such evidence, in addition to establishing cause and manner of death, is to facilitate the reconstruction of the circumstances that resulted in *that* body being in *that* location at *that* particular time. Skeletal cases in an outdoor setting provide an excellent opportunity to rally experts from the fields of forensic pathology, anthropology, odontology, botany, entomology, and meteorology. Enlistment of specialists such as engineers, geologists, marine biologists, oceanographers, and other consultants will, of course, be contingent on the type of grave involved.

Careful examination of the skeleton and clothing may provide the cause and manner of death, as well as suggest the identity of the victim. All recovered skeletal material should be radiographed and examined for evidence of antemortem disease and injury, as well as for features to determine age, sex, race, and estimated stature. Antemortem injuries should be differentiated from post-mortem artifact. The expertise of a forensic anthropologist is invaluable in helping to characterize these features accurately.

An attempt should be made to establish positive identification, albeit this is not always feasible in skeletonized cases. If a presumptive victim is known, comparison can be attempted with antemortem dental records, photographs that show the subject's teeth, computer superimposition of antemortem photographs on corresponding angled views of the skull, clinical radiographs that depict bony peculiarities, injuries, disease, and orthopedic hardware, and,

ultimately, DNA profiling. If there are no clues to identity, and the skull is available, two-dimensional or three-dimensional facial reconstruction using estimated soft tissue thickness based on race and sex (6) can provide a visual image that may trigger someone's recognition.

### Epilogue

In 1978, Grandpa lived in one side of the duplex house. Walter lived in the other side of the duplex with his wife (Grandpa's stepdaughter) and their two children. Apparent great animosity between Grandpa and Walter stemmed from interpersonal differences. Family members recall that around the time of Walter's disappearance, Grandpa was using a fifteen-foot sleeper travel trailer parked behind a row of hedges on his side of the yard behind the duplex. One of the concrete lids over the septic tank was kept ajar to accommodate the sewage pipeline that drained fluid waste from the trailer. The family eventually moved out of the duplex, but for many years after Walter's disappearance, his relatives continued to sit around at family gatherings contemplating Walter's whereabouts. In response, Grandpa would always chuckle "Walter, heh, heh, Walter's swimming in the septic!" Grandpa died in 1990, three years before Walter's remains were found.

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