Dean A. Hawley,[1] *M.D.; Richard C. Harruff,*[1] *Ph.D., M.D.; John E. Pless,*[1] *M.D.; and Michael A. Clark,*[1] *Ph.D., M.D.*

Disinterment from Paving Materials: Use of Heavy Equipment for Exhumation and Examination of Bodies

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ABSTRACT: Common paving materials—concrete and asphalt—pose an unusual and complex barrier to disinterment and examination of human remains. Although not commonly encountered, these materials are seen with sufficient frequency to justify consideration of the procedures and equipment necessary for disinterment. Over a seven year period we have encountered paving materials seven times. In each of these cases, the material was slightly different in quality, and different tools—including heavy construction equipment—were necessary. Sometimes the paving material could be managed without heavy power tools, but occasionally specialized construction tools have proven very useful.

KEYWORDS: forensic science, exhumation, paving materials, death investigation

Exhumation of a concealed body is always a complex process best handled by a team of experienced death investigators [*1*]. In any exhumation there will be observable features of physical evidence. Forensic pathologists, forensic anthropologists, crime scene evidence specialists, and law enforcement officers all perform unique and important tasks. The process for exhumation is a customary topic for forensic science textbooks [*2*]. Use of heavy construction equipment for exhumation, including the pitfall of creating artifactual injury of the body, has been previously described [*3*]. In general, tools such as backhoes should be avoided. The cases described herein go beyond standard exhumation and recovery of evidence due to an additional complication—encasement of the body within paving materials. When the body is actually encased in paving materials, heavy equipment is necessary for handling the mass and resistance of the material.

Case 1

A construction worker was driving an open-bed pick-up truck loaded with bags of concrete premix. The truck was struck head-on in a vehicle collision. Bags of the concrete mix moved forward through the rear window of the truck, broke open and spilled

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[1]Associate Professors, Culbertson Professor of Pathology, and Professor, respectively, Department of Pathology (Forensic Pathology), Indiana University School of Medicine, Indianapolis, IN.

the mix into the occupant compartment. The body was heavily crusted with the concrete mix. Blood from the fatal head injuries combined with the dry concrete mix and quickly set as a cast over the body. When paramedics arrived on the scene, the concrete was already hardened as a shell over the head and chest. At autopsy, the crust of concrete was 0.5 to 1.5 cm thick. The concrete could be spalled off of the skin surface with forceps and dura strippers, but much of the epidermis also peeled off.

Cases 2, 3 and 4

Three unrelated cases involved burial sites in dirt floors of barns, and then paving-over of the burial sites with poured concrete slabs. In each case, the suspect told investigators the approximate position of the body and the burial procedures. Superficial covering of the interment site with a poured concrete slab did not significantly impede disinterment in two of these three cases. In one case the slab was thin and poorly cast, so it was easily crumbled and removed by working from the edges with a hand shovel. One dense slab was lifted in entirety by loader/backhoe from one side, and found not to come in direct contact with the body which was buried in loose soil beneath the slab. In the third case, the right ankle and foot were embedded in the poured slab, and one distal lower extremity of the decomposing body was inadvertently disarticulated when the slab was lifted by one side with a loader/backhoe. The foot then had to be extracted by breaking up the concrete. None of these three cases involved concrete slabs that were fixed to deep footings or structural members of the building. One of us (D.H.) did once assist with removal of a section of structural basement flooring from a residence during a search for a body. With proper structural shoring (and considerable expense), even footings can be removed and searched.

Cases 5 and 6

Case 5 involved a body inside a 55-gal (208-L) steel drum filled with concrete. Case 6 involved a dismembered body inside two steel drums, both of which were filled with concrete. The drums weighed 258 to 325 kg (569 to 715 lbs). In both cases, the interment into concrete was sufficiently occlusive to obstruct access to the bodies by flies. No insect larvae were found on either of these markedly putrid bodies.

Encasement of the body by concrete poses a significant complication to disinterment, and may result in factitious injury or artifactual damage to the body during extracation. The physical quality of the concrete dictates the complexity of the removal chore. In Case 5 the dry concrete premix was probably poured into the drum over the body, and then water poured into the drum (Fig. 1) [*4*]. The material was not adherent to skin, and removal of the brittle, crumbling gravel was reasonably easy. In Case 6 the concrete was premixed and poured over reinforcing material inside the two steel drums (Fig. 2). Removal was extremely tedious.

Useful tools (provided by the local fire department) included a pneumatic chisel, used to cut the steel barrels and fragment the concrete, and a gasoline engine-powered abrasive-blade concrete-cutting saw, used to score the concrete and cut through reinforcing wire (Fig. 1*D* and *E*, Fig. 2*A* and *C*).

An outdoor work area was essential. The power tools generate too much noise and cement dust to use indoors, and the gasoline engine-powered concrete saw also produces exhaust fumes including carbon monoxide.

Both of our cases of drums of concrete demonstrated recoverable physical evidence within the concrete material. Reducing the concrete mass by hammer and chisel was very rewarding in both cases. After freeing the body from the concrete, the large blocks of concrete were reduced to smaller blocks with the pneumatic chisel. The smaller blocks

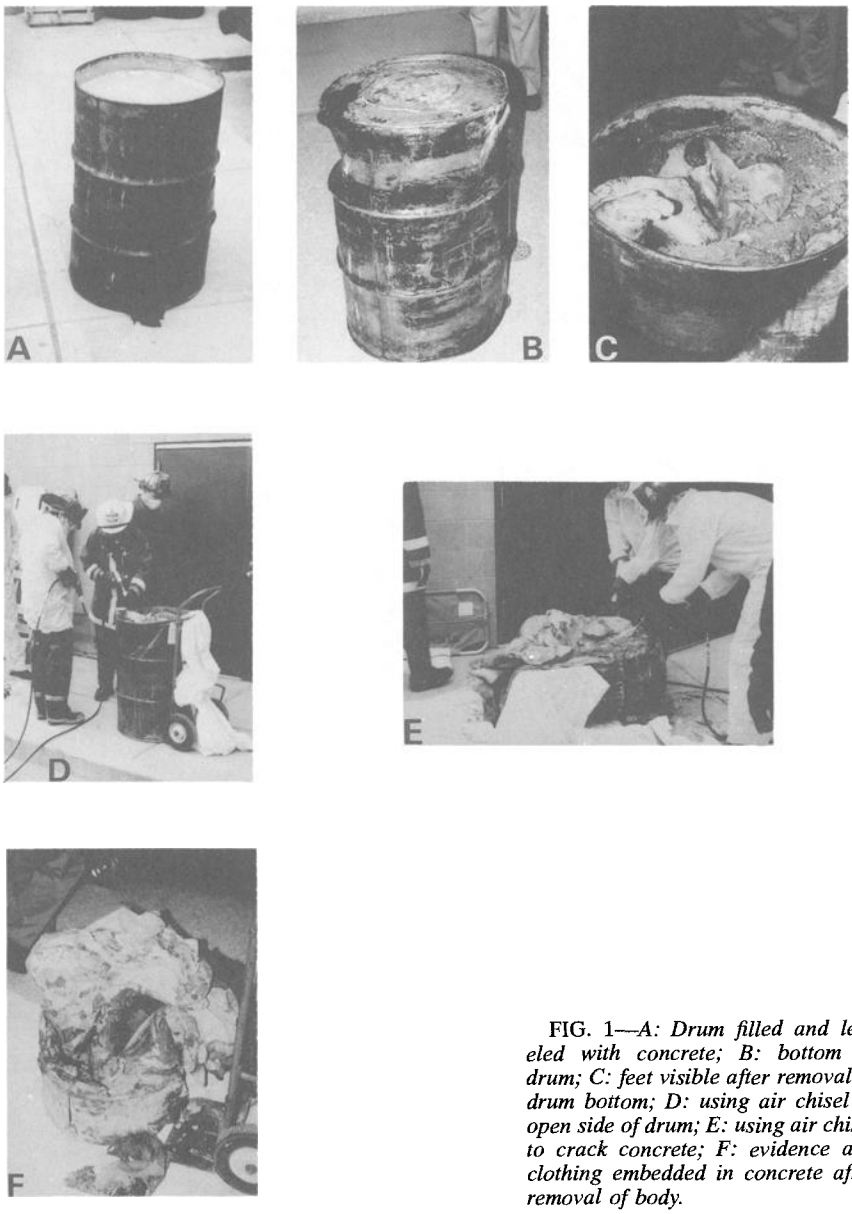

FIG. 1—*A: Drum filled and leveled with concrete; B: bottom of drum; C: feet visible after removal of drum bottom; D: using air chisel to open side of drum; E: using air chisel to crack concrete; F: evidence and clothing embedded in concrete after removal of body.*

were then further reduced by hand with hammer and chisel until the solid concrete was powdered. In Case 5 a Polaroid photograph of the deceased and the suspect was found (Fig. 1*F*). In Case 6 the concrete contained the chainsaw used for dismemberment, as well as the wallet with identification papers from the body (Fig. 2*E*).

Case 7

A worker at a coke (coal carbon) processing plant was responsible for inspection and operation of a tank of hot coal tar (creosote). He disappeared at work, and several hours

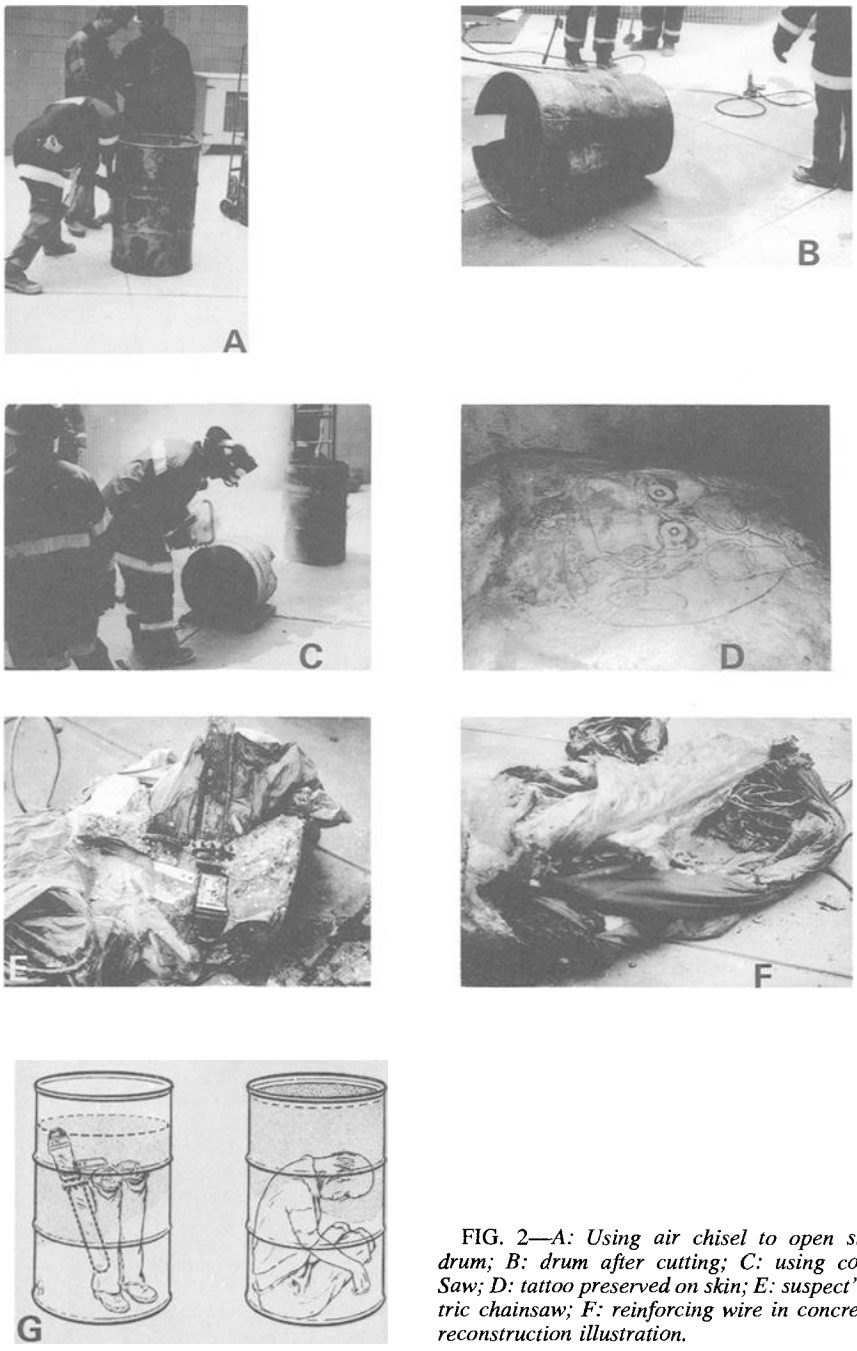

FIG. 2—*A: Using air chisel to open side of drum; B: drum after cutting; C: using concrete Saw; D: tattoo preserved on skin; E: suspect's electric chainsaw; F: reinforcing wire in concrete; G: reconstruction illustration.*

later his hard hat was found floating in the tank. After draining the tank, fire rescue crews were able to snare the body (Fig. 3*A* and *B*). Toxic solvent fumes emanated from the body as the tar cooled and solidified [5]. The body was left outdoors overnight (wintertime) to completely cool, and vent the volatile vapors. When the creosote tar cooled, the body was completely caked in a thick plastic "artificial asphalt" material. The asphalt saturated the heavy protective clothing on the body, creating a cloth-reinforced "asphalt lamination" up to 15 cm thick all around the body (Fig. 3*C*). The clothing was first cut with hammer and chisel, then the material peeled and spalled off. Much of the heat-altered skin and some muscle remained adherent to the clothing (Fig. 3*D*). The bulky, heavy asphalt and clothing had to be bagged and discarded as "infectious" waste material.

Discussion

These seven cases, all involving paving materials, required special equipment and technical considerations. From case to case the quality of the paving material, and the mechanism of encasement in that material, were sufficiently different to require a great diversity of tools and technique. The major obstacles were the mass of the paving material, and the resulting mass and volume of potentially infectious waste. Working the material, even reinforced concrete, was not particularly difficult given adequately heavy power tools and skilled labor.

Work site ground surface contamination with potentially infectious body fluids was considered as a potential problem, but this always occurs during natural decomposition

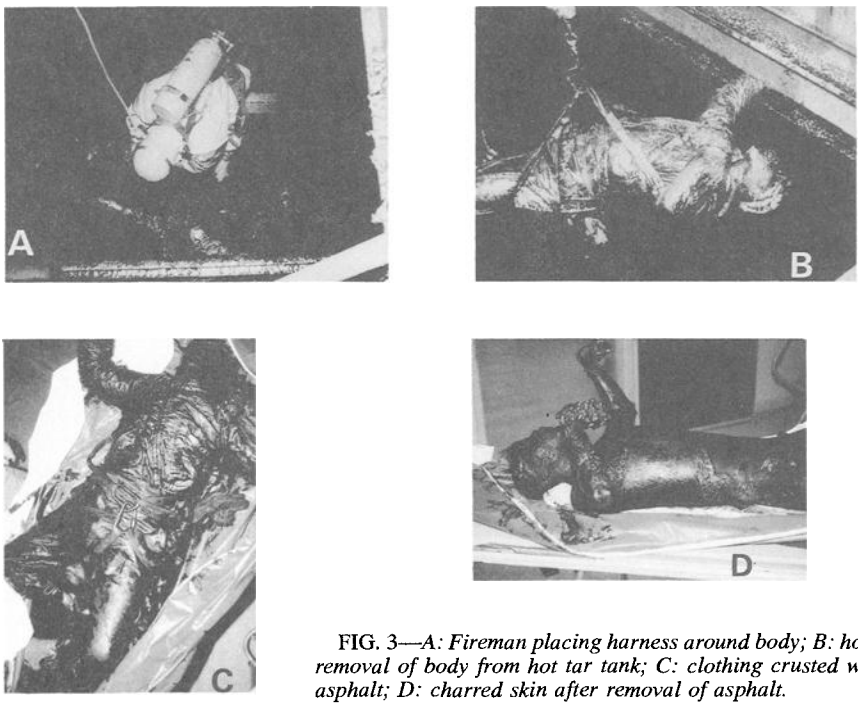

FIG. 3—A: *Fireman placing harness around body; B: hoist removal of body from hot tar tank; C: clothing crusted with asphalt; D: charred skin after removal of asphalt.*

of dumped bodies, and also occurs at the scene of severely traumatized bodies. After removal of the body and collection of evidence, generous rinsing of the worksite area with a fire hose will dilute and disperse the material to such an extent that long-lasting noxious odor can be eliminated.

A difficult problem for us was the immediate attraction of uncountable flies to the worksite during the lengthy process of disinterment from the concrete-filled drums. Flies were observed to flit from the contaminated equipment and exposed putrid body parts, to the respiratory passages of the workers. Surgical masks, and eventually complete air-tank respirator suits were required to protect the workers from mucous membrane contact with the flies. A screened work area would be ideal, but was not available to us.

Heavy pneumatic chisels were found to be usable with amazing precision considering the enormous (ground-shaking) impact forces generated. The chisels can be operated at very slow speed, basically one punch at a time, so soiling with body fluids was not a problem, and these tools were easily cleanable. The chisels could be handled with sufficient precision to cut only the steel drum, allowing the drum to be "peeled" away from the contents without any damage to the concrete or body. After removing the drums, the solid concrete blocks were visually examined for exposed clothing, which proved a useful plane of dissection between the concrete and the body.

The portable hand-held gasoline engine-powered concrete cutting saw was a superior tool for cutting reinforced concrete. Designed like a portable hand-held electric circular saw, but powered by a small chainsaw-style gasoline engine, it proved easily manageable for careful and precise cutting of the most tenacious blocks of reinforced concrete. However, the saw became seriously soiled with putrid body fluids. This tool defies "universal precautions" due to spattering of liquids from the rotating blade. A respirator mask and chemical hazard suit were worn by the operator. The protective equipment could be immersed in bleach after use but the saw could not be disinfected. This expensive tool was not reasonably cleanable after fouling by putrid body fluids. Don't expect to rent and return this tool.

Transmission radiography by X-ray or gamma ray, such as is used in laboratory and field testing of structural concrete, can reveal void cavities and entrained or entrapped air in concrete structures [*6*]. Whether these techniques would have been useful in evaluating the drums is unknown.

A problem with working outdoors is exposure to media cameras. We worked within an urban jail perimeter security wall. However, irresponsible local media coverage was still an annoyance for the steel drum cases. Initially attracted to the site of our work by law enforcement radio traffic, one generously funded TV crew got their helicopter to fly over our wall-enclosed site in order to get video coverage. Not to be outdone, a second less-prosperous but inventive crew went to a rental center and rented a truck with a pneumatic boom to raise their camera over our perimeter wall. An out-of-town site with a broad perimeter fence and wall would have been better, but could limit rapid access to special tools and personnel.

The local fire department provided the tools, expertise and skilled labor for the steel drum cases. They train in the use of these heavy tools, which they maintain for complex search and rescue situations (such as collapsed buildings in explosions or earthquakes). The firemen were extraordinarily helpful and resourceful. They endured the odor, the flies, and the inappropriate media coverage. We were advised in advance by the suspect that one concrete-filled drum would contain the chainsaw used by him to dismember the body. Speculating that his saw might have a gasoline tank, the firemen carefully and deliberately dissected the concrete with their pneumatic chisel until the *electric* chainsaw was disclosed.

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Address requests for reprints or additional information to
Dean A. Hawley, M.D.
Dept. of Pathology
Indiana University School of Medicine
635 Barnhill, M.S. 157
Indianapolis, IN 46202-5120
FAX (317) 278-2018