CASE REPORT

L. Riddick,[1] *M.D.; B. G. Brogdon,*[2] *M.D.; J. Lasswell-Hoff,*[3] *M.A.; and B. Delmas*[4]

Radiographic Identification of Charred Human Remains Through Use of the Dorsal Defect of the Patella

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ABSTRACT: A case of radiographic identification of charred human remains through use of the dorsal defect of the patella is reported. The nature of the defect and its incidence are discussed for reference purposes.

KEYWORDS: pathology and biology, human identification, X-ray analyses, patella

Radiographic examination of severely mutilated or decomposed human remains has become the mainstay of scientific identification [*1*]. Since the first case using antemortem and postmortem radiographs of the paranasal sinuses and mastoid air cells to make a positive identification of skeletonized remains in 1927, a wide spectrum of anatomic variants and unique lesions has been used to establish scientific identity [*1,2*]. The purpose of this case report is to document another characteristic radiographic lesion, the dorsal defect of the patella (DDP), which can be used to help establish the identity of human remains.

Case Report

On the morning of 2 March 1981, forest rangers discovered the smoldering shell of a 1977 Cadillac in an illegal dump in a remote area of northern Baldwin County, AL. Satisfied that

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[1]Forensic Pathologist, Alabama Department of Forensic Sciences, and Assistant Clinical Professor of Pathology, Department of Pathology, The University of South Alabama College of Medicine, Mobile, AL.

[2]Professor of Radiology, Department of Radiology, The University of South Alabama College of Medicine, Mobile, AL.

[3]Instructor, Department of Sociology and Anthropology, The University of South Alabama, Mobile, AL.

[4]Investigator, The Alabama Department of Forensic Sciences, Mobile, AL.

the fire was controlled, they left without examining the vehicle. When, on the evening of the same day, children playing in the area reported a body in the trunk of the car, the Baldwin County Sherriff's office began a more thorough investigation.

The vehicle was towed to the nearest wrecking garage where more adequate light was available. The trunk contained a fragmented, partially carbonized and calcined human skeleton lying on its left side in the fetal position. The only intact clothing was a few remnants of socks. The intensity of the heat had destroyed all but metallic portions of the passenger compartment; the only other identifiable nonmetallic remnants in the trunk were fiberglass strands from belted tires. All of the recognized skeletal remains were placed in five plastic bags and sent to the laboratory of the Alabama State Department of Forensic Sciences, Mobile, AL, for examination.

Background investigation revealed the vehicle to be registered to a 49-year-old male, who had been abducted at gunpoint from his home the previous evening. His medical history included a fracture of the right ankle 15 years previously, requiring a surgical fusion of the distal tibia with the talus. Unfortunately, no radiographs of the ankle were extant. However, two years before the incident under investigation, the owner of the burned vehicle had undergone a radiographic evaluation of his head, left elbow, and left knee for possible injuries suffered in an automobile crash. These radiographs were obtained.

Postmortem Examination

The fragments were sorted, identified, and photographed. The skull was totally shattered, the largest fragment measuring 7 cm. Most of the 34 warped pieces of the vault originated from the posterior portion of the skull. The fragments of mandible bore no teeth and were smooth (The owner of the vehicle had been edentulous.) All cervical vertebrae were intact but charred. Only fragile, fragmented pieces of 12 thoracic vertebrae, 19 ribs, and the sternum remained of the thorax. The anterior portion of the pelvic girdle still bore remnants of charred soft tissue as well as the proximal end of the left femur; the posterior pelvis was destroyed. Irregular pieces of the long bones of the legs were present, along with an intact left patella; the distal right tibia and the proximal bones of the right foot were fused to remnants of a sock. The bones of the left foot were fragmented. Of the shoulder girdle and upper extremities only small charred and calcined pieces were identified. Most of the bones, except the pelvis, were so carbonized or calcined that they crumbled at the slighest pressure. The victim was determined to be male by dissection of the soft tissues of the anterior pelvis, which disclosed a prostate gland with nodular hyperplasia.

Routine postmortem radiographs revealed a talo-tibial fusion of the right ankle and absence of the distal right fibula (Fig. 1). (The orthopedic surgeon who had operated on the owner of the vehicle indicated that this was the type of fusion he had performed but could not be more specific.) No foreign objects or metallic fragments were identified in any of the skeletal remains.

An anthropologist reconstructed the skull from the warped fragments by placing them over a mold of moist sand and fastening them with water-soluble glue. The reconstituted vault revealed the presence of a gunshot exit wound in the occiput. The previous radiographs of the skull had disclosed several distinctive features, but warping of the fragments and absence of the anterior portions of the skull, including the frontal sinuses, precluded adequate comparison with the radiographs of the automobile's owner.

A small semispherical punched-out defect was noted on the dorsal surface of the superolateral aspect of the left patella (Fig. 2). A radiologist recognized this uncommon lesion as a dorsal defect of the patella, which is sometimes identified incidentally in radiographs of knees. Detailed comparison of postmortem radiographs of the patella (Fig. 3) with the previously obtained frontal radiograph of the left knee (Fig. 4) showed the dorsal defects to be identical. Furthermore, the configuration of the patella in each instance was identical in

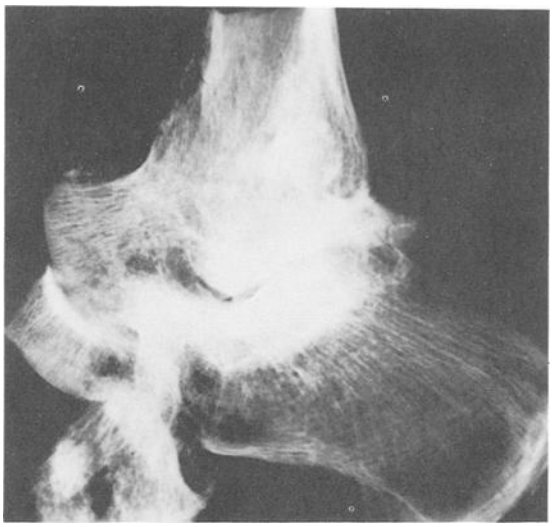

FIG. 1—*A lateral radiograph of the right ankle reveals a talo-tibial fusion and absence of the distal fibula.*

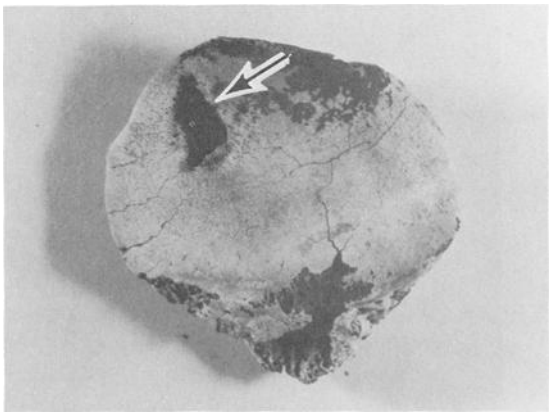

FIG. 2—*The dorsal surface of the charred left patella contains a typical defect in the superolateral aspect* (arrow). *The subcortical extent of the lesion is larger, as shown on a subsequent radiography (see Fig. 3).*

every respect, including the identification of a minimal ridge of hypertrophic change across the superior margin of the bone (Fig. 5).

The circumstantial evidence, medical history including appropriate radiographs of the ankle, and the presence of an identifiable patellar lesion on antemortem and postmortem radiographs established the identity of the victim in this case beyond any reasonable doubt.

Discussion

The DDP is a distinctive, well-marginated, lytic lesion always located in the subchondral bone of the dorsal aspect of the patella. It usually lies in the superolateral angle of the bone and only rarely has a more central location [*3*]. In the three cases reported in which a

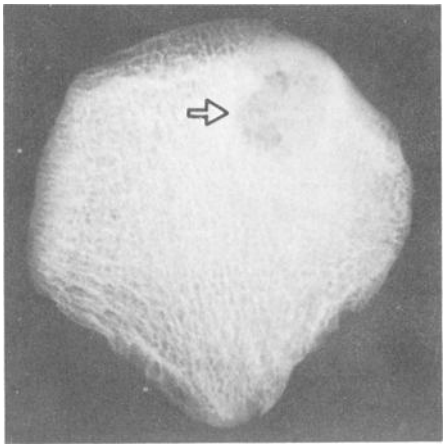

FIG. 3—*A frontal radiograph of the charred left patella demonstrates the classic radiographic appearance of a dorsal defect of the patella* (arrow).

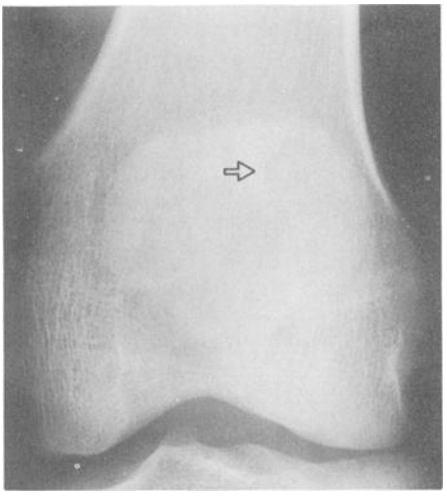

FIG. 4—*A frontal radiograph of the presumed victim's left knee, following a vehicle accident in April 1979, reveals the left patella contains a dorsal defect* (arrow).

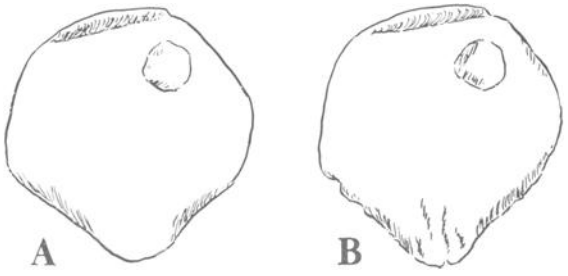

FIG. 5—*Tracings of the antemortem* (A) *postmortem* (B) *radiograph of the left patella (corrected to same size) demonstrate identical features and configuration.*

microscopic examination had been made, the lesion consisted of a nonspecific fibrous matrix surrounding bone spicules [*3,4*]. The etiology of DDP is not known but probably represents a developmental alteration of the ossification center. DDP can be confidently differentiated from other lesions of the patella by its characteristic radiographic appearance.

Of the cases previously reported in the literature [*3–5*] most were patients in the second or third decades of life; hence, our case is the oldest reported to date. The incidence of the defect is being investigated. In a series of 73 medico-legal autopsies, no defect was identified in the right patella at gross examination. The lesion has not been found in examination of both knees in 20 stillborn premature infants, as would be expected from the probable developmental nature of the lesion. The autopsy series will be expanded. The radiological incidence of the lesion is approximately one per hundred knees [*6*].

Scientific identification of severely damaged human remains requires the use of all available material, techniques, expertise, persistence, and some degree of imagination and luck. Incinerated, partially carbonized skeletal remains present unique problems in evaluation and identification [*7*]. Fragmentation creates obvious difficulties, whereas heat warps and shrinks bone, distorting characteristic features. Extensive carbonization and calcination will ultimately destroy the distinctive pattern of the bone, thus precluding use of trabecular signatures for scientific identification. Finally, fragmentation, distortion, and loss of external configurational features may severely compromise the possibility of comparison of postmortem radiographs of remains with antemortem radiographic examinations of the suspected victim. In such cases, relatively large, well-defined structural changes, such as the dorsal defect of the patella, may prove to be the most distinguishing feature for establishing scientific identification.

References

[*1*] Murphy, W. A., Spruill, F. G., and Gantner, G. E., "Radiologic Identification of Unknown Human Remains," *Journal of Forensic Sciences*, Vol. 25, No. 4, Oct. 1977, pp. 727–735.

[*2*] Culbert, W. L. and Law, F. M., "Identification in Comparison of Roentgenograms of Nasal Accessory Sinuses and Mastoid Processes," *Journal of the American Medical Association*, Vol. 88, No. 21, 21 May 1927, pp. 1634–1636.

[*3*] Haswell, D. M., Berne, A. S., and Graham, C. B., "The Dorsal Defect of the Patella," *Pediatric Radiology*, Vol. 4, No. 4, 1976, pp. 238–242.

[*4*] Hunter, L. Y. and Hensinger, R. N., "Dorsal Defect of the Patella with Cartilagenous Involvement: A Case Report," *Clinical Orthopedics and Related Research*, No. 143, Sept. 1979, pp. 131–132.

[*5*] Goergen, T. G., Resnick, D., Greenway, G., and Saltzstein, S. L., "Dorsal Defect of the Patella (DDP): A Characteristic Radiographic Lesion," *Radiology*, Vol. 130, No. 3, Feb. 1979, pp. 333–336.

[*6*] Johnson, J. F. and Brogdon, B. G., "Dorsal Defect of the Patella (DDP): Incidence and Distribution," submitted for publication.

[*7*] Pless, J. E., "Hazards of X-Ray Comparison of Partially Incinerated Human Remains," Abstract G42, American Academy of Forensic Sciences Program, Feb. 1982, p. 94.

Address requests for reprints or additional information to
LeRoy Riddick, M.D.
Forensic Pathologist
Alabama Department of Forensic Sciences
102 Church St.
Mobile, AL 36602