CASE REPORT

Thomas Riepert,[1] M.D.; Christian Rittner,[1] M.D.; Dirk Ulmcke,[1] M.S.; Sylvester Ogbuihi,[1] M.D.; and Franz Schweden,[2] M.D.

Identification of an Unknown Corpse by Means of Computed Tomography (CT) of the Lumbar Spine

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ABSTRACT: For the first time, a case is described in which an unknown corpse is identified by the comparison of antemortem and postmortem computed tomographic (CT) images. A posterolateral disc herniation at L5-S1 on the right side, Schmorl's nodes and a lucency in the ilium were found in identical locations in each case. Additionally there were characteristic morphological similarities in the vertebral bodies, spinous processes, transverse processes and neural arches. In CT identification, as in conventional radiographic identification, one must try to reproduce comparable scanning conditions and images because apparent differences in the roentgenological morphology can occur as a result of different gantry angles or slice thicknesses.

KEYWORDS: forensic science, radiographic identification, human identification, computed tomography, lumbar spine, unknown corpse

Radiographic identification, which is regarded as a meaningful and reliable method, is accomplished by comparison of antemortem and postmortem conventional X-ray images. The following case is remarkable because, for the first time, a comparison of antemortem and postmortem computed tomographic images was used.

Case History

A torso, consisting of the pelvis, lumbar spine and parts of the thoracic spine, was recovered from a river. On the basis of police investigations, there was suspicion that the torso might be that of a 50-year-old male whose lumbar spine had been examined by CT a few weeks before the time when he had last been seen alive.

The antemortem CT examination consisted of 23 scans (4 mm slice thickness with 4 mm table feed) of the levels L3-L4, L4-L5, and L5-S1. The postmortem CT scans were prepared using the same technique as far as possible, additionally with continguous 2 mm thick slices.

It was possible to etablish major points of agreement between the antemortem and postmortem CT scans as follows:

1. Extruded right-sided posterolateral disc herniation at L5–S1 (Fig. 1),
2. Schmorl's node on the right side in the lower portion of the body of L4 (Fig. 2),
3. morphology of the vertebral bodies, spinal and transverse processes, and also of the neural arches, in particular a club-shaped

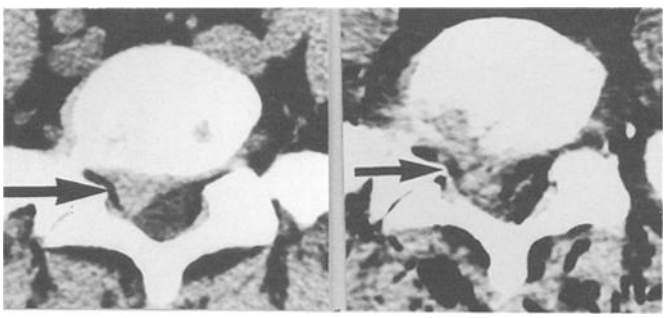

FIG. 1—*Posterolateral disc herniation* (arrows) *L5-S1: antemortem* (a), *postmortem* (b).

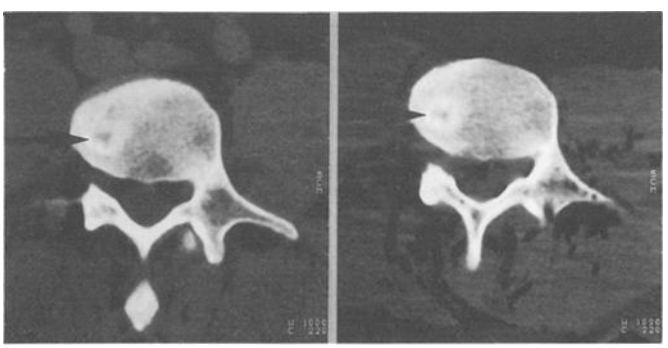

FIG. 2—*Schmorl's node* (arrows) *in the lower portion of the fourth lumbar vertebral body: antemortem* (a), *postmortem* (b).

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[1] Institute of Forensic Medicine of the Johannes Gutenberg University, Mainz, Germany

[2] Clinic of Radiology of the Johannes Gutenberg University, Mainz, Germany

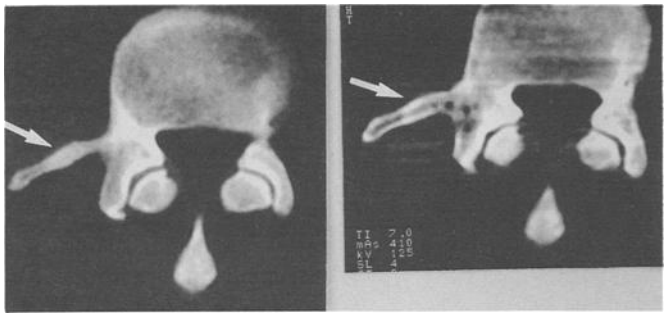

FIG. 3—*Club-shaped osseous thickening* (arrows) *of the right transverse process of the fourth lumbar vertebral body: antemortem* (a), *postmortem* (b).

osseous thickening of the right transverse process of L4 (Fig. 3), and

4. lucency in the left ilium (Fig. 4).

The disc herniation in identical location and the characteristic morphology of the osseous structures are confirmatory, in particular, the unilateral, club-shaped osseous thickening of the transverse process L4 and the lucency in the left ilium. The presence of Schmorl's nodes in a comparable position provides additional compatibility of the scans. Finally, there are no contradictions between the antemortem and postmortem CT images. Thus, there is no serious doubt that both antemortem and postmortem images can be attributed to the same torso.

Discussion

Since the first radiographic identification in 1927 [*1*], the method has been applied in numerous individual cases and in mass casualty situations [*2–4*]. The importance of the case being presented lies in the fact that for the first time CT scans determined an identity. In view of the increase in the number of CT examinations being made, a comparable constellation had already been prophesied for the future [*5*]. Reichs and Dorion [*6*] worked out a model for classifying frontal sinus morphology in the cranial computer tomogram following Yoshino et al. [*7*] using conventional radiographs. They checked their model successfully in one case which had already been clarified by conventional radiography. Haglund and Fligner [*8*] confirmed an identification by comparison of a lateral topogram of the skull with a conventional postmortem radiograph. Rougé et al. [*9*] succeeded in excluding the identity by computed tomography comparison of the lumbar spine, in particular on account of the differing width of the lumbar canal and because of discrepancies in the vertebral body morphology (presence or absence respectively of osseous bridges in the vertebral body) in the lateral tomogram.

In conventional radiographic comparison apparent differences in X-ray morphology can result from differing beam angulation and patient positioning. Additional sources of error may be found in CT comparison. The gantry angle and slice thickness are of special importance for the image geometry, at least in the case of scans of the lumbar spine. In the present case, identification was facilitated by the presence of striking pathological findings. Positive identification would have been considerably more difficult just on the basis of "normal" morphology.

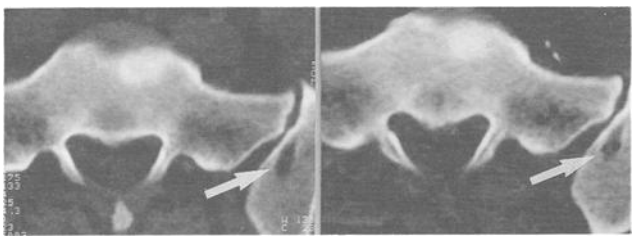

FIG. 4—*Lucency* (arrows) *in the left ilium: antemortem* (a), *postmortem* (b).

Acknowledgments

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References

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

[*2*] Neiss, A., "Röntgenidentifikation durch Bildvergleiche," *Deutsche Zeitschrift für die gesamte Gerichtliche Medizin,* Vol. 55, No. 3, September 1964, pp. 135–136.

[*3*] Singleton, A. C., "The Roentgenological Identification of Victims of the "Noronic" Disaster," *American Journal of Roentgenology and Radium Therapy,* Vol. 66, No. 3, 1951, pp. 375–384.

[*4*] Sassouni, V., "A Proposed Method of Identification of War-Dead by Means of Roentgenographic Cephalometry," *Journal of Forensic Sciences,* Vol. 4, No. 1, October 1959, pp. 1–10.

[*5*] Bonell, H. J., "Remains Identification by Frontal Sinus Radiographs (Letter to the Editor)," *Journal of Forensic Sciences,* Vol. 37, No. 5, September 1992, p. 1206.

[*6*] Reichs, K. J. and Dorion, R. B. J., "The Use of Computed Tomography (CT) Scans in the Comparison of Frontal Sinus Configurations," *Canadian Society of Forensic Science Journal,* Vol. 25, No. 1, 1992, pp. 1–16.

[*7*] Yoshino, M., Miyasaka, S., Sato, H., and Seta, S., "Classification System of Frontal Sinus Patterns by Radiography. Its Application to Identification of Unknown Skeletal Remains," *Forensic Science International,* Vol. 34, No. 4, 1987, pp. 289–299.

[*8*] Haglund, W. D. and Fligner, C. L., "Confirmation of Human Identification Using Computerized Tomography (CT)," *Journal of Forensic Sciences,* Vol. 38, No. 3, May 1993, pp. 708–712.

[*9*] Rougé, D., Telmon, N., Arrue, P., Larrouy, G., and Arbus, L., "Radiographic Identification of Human Remains Through Deformities and Anomalies of Post-Cranial Bones: A Report of Two Cases," *Journal of Forensic Sciences,* Vo. 38, No. 4, July 1993, pp. 997–1007.

Address requests for reprints or additional information to
Thomas Riepert, M.D.
Institut für Rechtsmedizin
Johannes Gutenberg Universität
Am Pulverturm 3
55131 Mainz
Germany