

CASE REPORT

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The Use of Thoracolumbar and Hip Joint Dymorphism in Identification

ABSTRACT: A case of roentgenographic identification of a deceased person is presented. Comparison of antemortem and postmortem radiographs of the vertebral column and hip joint, for the purpose of identification, was based on the deceased medical history, and the fact the deceased was endentulous, and fingerprint comparison was not feasible. Evaluation of anatomical variants, due to the effects of degenerative disease, provided positive identification in a visually unidentifiable deceased person.

KEYWORDS: forensic science, forensic radiology, identification, thoracolumbar, dymorphism

If a body is charred to such a degree that facial structures are mutilated and no fingerprints or dental records are available, or the deceased is endentulous, then other methods of identification must be used (1). If tentative identification is known, investigations of the availability of antemortem radiographs taken when the person was alive for comparison with postmortem radiographs, are one of many alternative methods for identification (1). The use of radiographs in routine and mass disaster identification has long been in effect, and its application in necroidentification is effective, swift, and relatively easy (2). Identification of unidentified human remains has utilized comparative radiography of the spine, pelvises, and hips based on degenerative changes (3,4).

The lumbar spine and hip joint can provide points of concordance, as unique as fingerprints to the individual. Positive identification may then be based on the similarity in either normal or abnormal structures.

Matching skeletal anomalies such as osteophytes, distal features of the spinous and transverse processes, identical convexities of thoracolumbar scoliosis and radiodensities and radiolucencies, have provided positive identification.

Less common anatomical variants able to be utilized are congenital anomalies, such as congenital acetabular dysplasia and associated or age related degeneration of the hip joint (5), with erosion of the head of the femurs and acetabula as identification markers for comparison.

Variations in vertebrae are affected by race, sex, and developmental factors, such as genetics and the environment. Additional to degenerative diseases, anatomic variants in the form of missing, additional, and variations of skeletal elements can be utilized.

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Case Report

In July 1998, a house in a suburb of Western Sydney, New South Wales, Australia, was engulfed by fire. Reconnaissance by fire officers found a deceased in a rear bedroom of the property under the collapsed roof. The deceased was lying supine with the right arm lying on top of an electric bar heater, which appeared to be the ignition source of the fire. The deceased was an elderly female residing on her own, and severely restricted in mobility due to advanced osteoarthritis of the right hip. Mobility was assisted with use of a walking frame and wheelchair. The deceased had previous admissions four years earlier to hospital for osteoarthritis and neurological aspects of her disease. Visual and fingerprint identification of the deceased was not possible due to incineration.

External examination by the forensic pathologist revealed a denture in the upper jaw, and an edentulous mandible, therefore preventing dental identification.

Cause of Death

Examination of the airways revealed a lack of soot macroscopically and microscopically and a carbon monoxide level of 2% saturation, indicating the deceased was probably dead prior the fire starting, or shortly afterwards. Morphine levels of less than 0.05 mg/L were detected. Left ventricular hypertrophy of the heart was present. The proximal and middle segments of the left anterior descending coronary artery showed foci of eccentric calcific atherosclerosis with 80% stenosis.

The myocardium had replacement fibrosis and patchy interstitial scarring of the anterior wall of the left ventricle and interventricular septum, with no evidence of a recent myocardial infarction. The cause of death was determined as coronary artery atherosclerosis. To establish identification antemortem radiographs were obtained from the hospital that investigated the deceased orthopaedic condition.

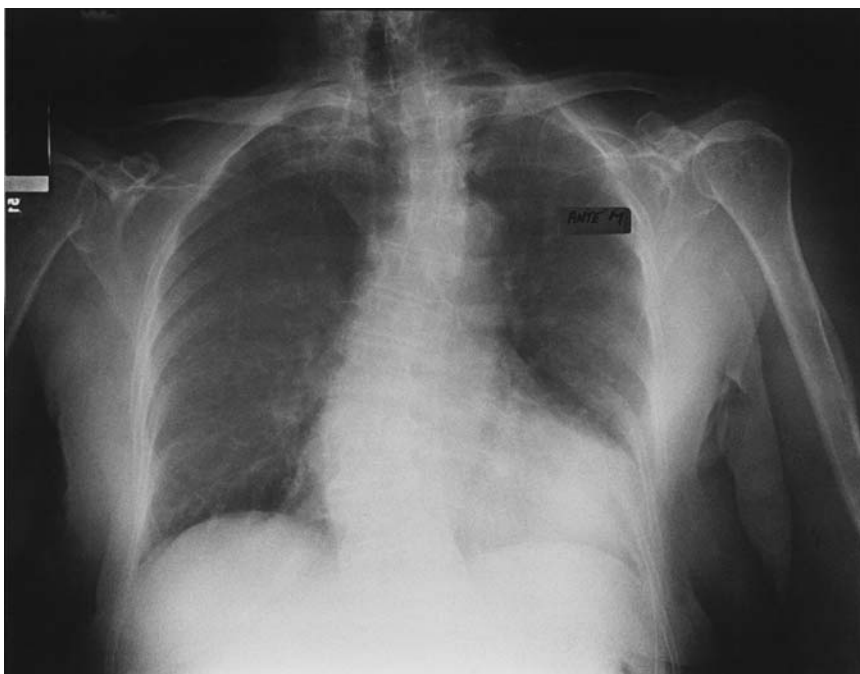


FIG. 1—(A) Antemortem: radiograph of thoracic and lumbar spine showing age related dysmorphic features.



FIG. 1—(B) Postmortem: radiograph showing the same anatomic variants of the deceased.

Postmortem radiographs showed an upper and lower scoliosis of the thoracic spine, convex to the left and right respectively, and a scoliosis of the lumbar spine, convex to the right. Advanced osteoarthritis was present in the right hip joint with significant femoral head erosion. Disc degeneration and osteophytic lipping was present in the lumbar vertebrae.

Results and Discussion

Comparison of the antemortem and postmortem radiographs of the lumbar spine and right hip joint resulted in positive identification of the deceased.

Dysmorphic features evident were degenerative changes to the lumbar vertebrae and right hip, with contour variants to the vertebral bodies and right femoral head and acetabulum. Points of dysmorphic concordance included:

- Identical convexities of the thoracic and lumbar spine (Figs. 1A and 1B).
- Significant concavities along the right side of the lumbar vertebral bodies at L2 to L5, and along the left side at T12 to L3 (Figs. 1A and 1B).
- Unique osteophytic processes and loss of intervertebral disc space in the lumbar vertebrae (Figs. 1A and 1B).
- A slight retrolisthesis of the body of L2 relative to L3.

- The inferior and superior aspects of the opposing vertebral bodies of L3 and L4, depicting a pincer like shape (Figs. 2A and 2B).
- Focal hypodence area in the distal half of the right femoral shaft.
- The right side of the body of L2 and L3 vertebrae demonstrates a round osteophyte (Figs. 2A and 2B).
- Advanced osteoarthritis in the right hip joint with considerable femoral head erosion (Figs. 3A and 3B).
- Identical configuration of the greater and lesser trochanters.
- Concordance with pattern of right acetabular rim erosion (Figs. 3A and 3B).

Radiological identification in this case used concordant dysmorphic features of the thoracolumbar spine, right femoral head and acetabulum as age related degenerative changes. Normal and abnormal anatomical variability of the vertebral column and hip joint provide positive identification as long as beam angulations and positioning of the body equates to the antemortem radiographs, and that specific markers relating to degenerative changes have remained stable over the antemortem-postmortem period.

In cases where antemortem radiographs were taken within several years of the time of death, osteophytes may be quite useful for identification, but their accumulation may lead to significant change over a longer period of time (6). This case report demon-



FIG. 2—(A) Antemortem: lumbar vertebrae and right hip showing concavities, osteophytic processes, lumbar disc disease, femoral and acetabular erosion. Discography instrumentation at level of L1–L2, intervertebral space. Radiolucencies present body of L1 and L2.



FIG. 2—(B) Postmortem: identical dysmorphic features of lumbar vertebrae and right hip of the deceased.



FIG. 3—(A) Antemortem: right femoral head and acetabulum showing osteoarthritic changes.



FIG. 3—(B) Postmortem: bilateral hip and lumbar—pelvic radiograph showing identical pattern of right femoral head and acetabular erosion.

strated that the antemortem-postmortem radiographic period of four years provided a high degree of specificity and stability in degenerative change with no intraindividual variation over the time period enabling the identification.

The case report also demonstrates the importance of performing a postmortem examination to determine whether the deceased was alive at the time of the fire, and if not eliminating suspicious circumstances. In this case the manner of death was natural cause, rather than smoke inhalation, and or incineration, associated with an accidental housefire, as preliminary investigations proposed.

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Erratum/Correction of Hulewicz B and Wilcher GW. The Use of Thoracolumbar and Hip Joint Dysmorphism in Identification. *J Forensic Sci* 2003 July;48(4):842–847.

It has come to the attention of the Journal that the footnote 2 for Glenn Wilcher is misprinted. Below is the correct footnote 2, which is the same as footnote 1:

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tute of Clinical Pathology and Medical Research, Westmead Hospital, Sydney, Australia.

The Journal regrets this error. Note: Any and all future citations of the above-referenced paper should read: Hulewicz B and Wilcher GW. The Use of Thoracolumbar and Hip Joint Dysmorphism in Identification. [published erratum appears in *J Forensic Sci* 2003 Nov;48(6)] *J Forensic Sci* 2003 July;48(4):842–847.