



Physical Anthropology Section – 2004

H67 Diagnosing Degenerative Pathologies in an Unidentified Skeleton

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By attending this poster presentation participants should expect to learn: the challenges of creating a biological profile for an unidentified skeleton with multiple pathological conditions; will learn the osteological indicators of several other conditions that exhibit similar markers; and will learn the methods used to evaluate unique pathologies.

This presentation will impact the forensic community and/or humanity by illustrating the challenges of diagnosing pathologies. The forensic science community can benefit from the methods and process of evaluating overlapping pathologies and the challenges faced in this case of creating a biological profile for an unidentified individual.

In 1997, a nearly complete human skeleton was discovered by utility workers in a remote, uninhabited wetland area in Staten Island, New York. The upper portion of the skeleton was found under a water heater, partially inside a plastic bag. The individual was fully clothed and skeletonized, with only a small amount of mummified soft tissue adhering to the patellas and proximal tibia. The skeleton was analyzed by the anthropologist at the Office of Chief Medical Examiner, City of New York. A biological profile was created evaluating the individual's age, sex, and stature. Examination of the skeleton revealed features associated with at least two separate pathological conditions severely affecting the spine and joints.

Anthropological examination of the innominates, mandible, and postcranial skeleton suggest the individual is male. The age range based on pubic symphysis morphology and sternal rib end analysis is 45-60 years of age. A comprehensive analysis of ancestry could not be conducted, as the cranium was not recovered. The individual's stature was obtained by using the forensic femur formula, yielding an estimated stature of 5'4" +/- 3.4".

The most prominent of the skeleton's pathological features is the thoracic region of the spine where T3 through T7 are completely fused and form a 90-degree anterior bend. There is no intervertebral space and the discs are compacted and calcified. The interand supraspinousligaments on the posterior surface of these vertebrae are ossified. The anterior and lateral surfaces the vertebral bodies display thick syndesmophytes making it difficult to differentiate them. The lower ribs are very straight, likely due to the anterior bend of the torso and the pressure exerted by the organs. In the thoracic region several ribs are also fused at the costovertebral joint.

The first through the fourth lumbar vertebrae are fused by thin, vertical fibrous endesopathic growths appearing at the insertion of the longitudinal spinal ligament on the anterior surface and lateral margins of the vertebral bodies. These vertebrae are connected by thin bony bridges called sydesmophytes. Several of the lumbar vertebrae are also fused at superior and inferior zygapophyses. Cervical vertebrae 3 through 5 and 7 have small fused syndesmophytes on the anterior vertebral bodies and the intervertebral space is maintained. The sacroiliac joints are fused and entheses of the femur, patellae, scapulae, clavicles, tibiae, fibulae and os coxae display ossified tendons and ligaments.

Tuberculosis of the spine (Pott's disease) is characterized by the collapse of a portion of the spine into an angular kyphosis. Pott's disease begins with an abscess in the vertebral body caused by inhalation of *Mycobacterium tuberculosis* into the lungs, passing through the lymphatic system to the spine. This leads to the destruction of the intervertebral space and collapse of the spine into an angular deformity. It usually affects between two and four vertebrae, often at the lower thoracic and upper lumbar region. The involvement of at least four thoracic vertebrae is necessary for diagnosis.

Pott's disease is a lytic process and bone regeneration is uncommon. This case has significant bone regeneration, however it is likely due to the bone-forming attributes of another origin. Pott's disease rarely affects the posterior neural arch, transverse processes, and spinous processes, but this has been observed in untreated adults.

Ankylosing spondylitis is a degenerative inflammatory disease affecting connective tissue at ligament insertions. It often affects males between the ages of 15-35. It is of unknown etiology, however individuals with the disease often have the antigen HLA-B27 in their blood. The disease causes erosion of the bone at entheses and new bone replaces it and the connecting ligament ossifies. A new insertion is formed above the cortical bone creating an irregular bony process. In this case, the os coxae, the lesser trochanter, and both femora and patellae all display these enthesopathies. Fusion of the sacroiliac joints, which has been called the hallmark of ankylosing spondylitis, is present in this case as well as the progressive fusion of the anterior longitudinal ligament. Syndesmophytes, bridge the gap between the vertebral bodies and consequently fuse several vertebrae together forming a bamboo-like appearance. The lumbar and cervical vertebrae are consistent with this diagnosis as they display symmetrical syndesmophytes that become smaller in the cervical region. Involvement and fusion of the zygapophyseal joints and costovertebral joints may be present in cases of ankylosing spondylitis and are present in this case. The features of the appendicular skeleton, as well as



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the early stage of bamboo-like appearance of the spine are consistent with a diagnosis of ankylosing spondylitis.

In an effort to understand the origins of these pathologies and create a more complete biological profile, a DNA test is being conducted to determine if the individual did indeed have Pott's disease. In addition, it is believed that this individual also suffered from ankylosing spondylitis. In spite of these distinctive skeletal changes, the decedent remains unidentified.

Forensic Anthropology, Ankylosing Spondylitis, Tuberculosis