

ANTHROPOLOGY

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Incidence of Arthritis in a Prehistoric Middle Mississippian Indian Population

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Arthritis is one of the oldest and most widely prevalent infirmities of men and animals. Until recently, it has also been one of the most neglected diseases for many have considered it a part of the inevitable aging process.

One of the most aged arthritic specimens resides in the Museum of Natural History at the University of Kansas. This large swimming reptile, *Platecarpus*, lived 100,000,000 years ago and had multiple arthritis. The Ape man of two million years ago had chronic arthritis of the spine as did Java man 500,000 years ago.² The lower cervical and upper thoracic vertebrae of Neanderthal man (40,000 B. C.) show arthritic involvement. Egyptian mummies of 8,000 B. C. also show evidences of this difficulty.

Comroe² devotes a chapter to spas and said that the Roman baths were built to help alleviate arthritic suffering. In "Yellowstone's Bannock Indian Trails," Wayne Replogle refers to the use of nature's steam and mud baths by American Indians. They prepared a liniment and also a methyl salicylate from Wintergreen (*Gaultheria humifusa*).

Authorities differ on the nomenclature and number of divisions to be used in the classification of arthritis. Osteoarthritis was called hypertrophic arthritis by Goldthwaite because the ends of bones were frequently enlarged and new bone is produced near the joint. Some cases are referred to as chronic senescent arthritis. Comroe² suggests that the term degenerative joint disease will prevent confusion over terminology.

Usually, joint changes occur to some extent in all persons past their thirties or forties. They do not necessarily notice any symptoms. The first changes occur in the synovial membranes, the articular cartilage and the articular surfaces of bone. Hyaline cartilage tends to undergo degenerative atrophy, osteophytes may form and produce new bony tissue in the joints. If this hypertrophic change is extensive and occurs in combination with rarefaction of the adjacent cancellous and cortical bone such things as perforation of the acetabulum can occur. Or, weight and pressure changes can cause a bending of the neck of the femur and subsequent crippling.

Another bone change observed is lipping of vertebrae, femoral condyles, and/or head of the tibia in particular. Lipping, or "mushroom" extension, occurs at the edge of the body of a vertebra and may

vary from a small projecting rim to a large ruffly collar extending outwards even to the extent of forming an articulation with the outgrowth on the vertebra above or below. Complete fusion or ankylosis occurs more readily if the anterior and posterior longitudinal ligaments are areas of osteophytic deposition.

Dislocations and fractures can result in or near areas of constant pressure and friction. The rarified bone may bend and the constant wear will produce a different appearance of the bone. This process is referred to as eburnation. The bone is worn away and appears white and polished and looks very dense and hard but microscopic sections will show the wastage.

Of course, working on skeletal material *in situ*, it is not always possible to see all of these manifestations. These changes also occur in lower animals, one author referred to a horse skeleton which showed vertebral fusion at the area of the anterior longitudinal ligament due to strain from carrying overloads. In the Royal College of Surgeons Museum there is an extinct giant sloth whose great weight caused fusion of the lumbar vertebrae.

Osteoarthritis may result from trauma, mechanical or toxic; from an infectious agent by way of the blood stream; or from attrition. Articular cartilage has a disadvantageous position biologically and it is difficult for it to nourish and repair itself. One of the latest theories mentioned is that protein deficiency may be a cause.

Rheumatoid arthritis and spondylitis deformans are other pathological types but are differentiated from osteoarthritis by a general absence of osteophytic lipping and a type of ankylosis which eventually produces complete spinal rigidity combined with a deformity produced by a kyphotic curvature.

In order to determine the incidence and degree of osteoarthritis in prehistoric series, the following scale was employed:

Stage I—is characterized by slight lipping at the superior and inferior margins of the bodies of the vertebrae, or other joints,

Stage II—exhibits a more pronounced degree of lipping,

Stage III—is characterized by extensive lipping often resembling a mushroom-like eversion,

Stage IV—exhibits bony spurs or bridges with an increased mushroom-like outgrowth,

Stage V—presents actual ankylosis or bony union between two or more vertebrae, or other bones.

In all cases where the lumbar or cervical vertebrae were covered by portions of other skeletons, estimates were made, where possible, from other regions such as the scapula, and articular surfaces of the humerus or femur.

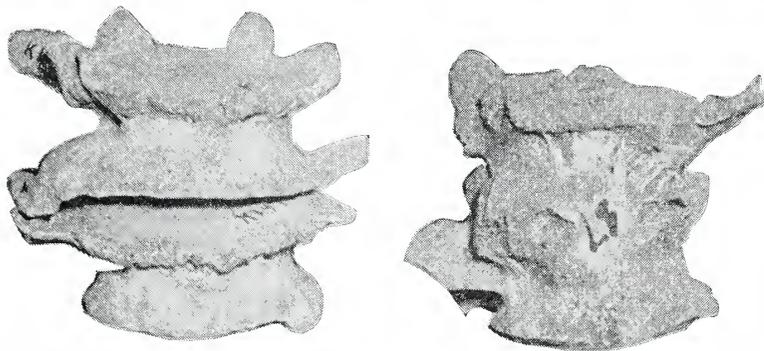
The skeletal material with which this paper concerns itself is located at Dickson Mound State Memorial near Lewistown, Illinois. Archaeologists have determined that these Indians lived in this area from 900-1500 A. D. and belonged to Spoon River Focus of the Middle Mississippi Culture. Over 200 burials, nearly all in extended position, have been excavated and a building has been erected over them to

preserve them for educational purposes. The burial of the dead in wind-blown loess insured an excellent state of preservation.

The age determinations of this skeletal material were made by Dr. Georg Neumann,¹ and involved all available criteria, such as epiphyseal union, changes in the pubic bone, endocranial suture closure, etc.

The Spoon River Focus people were primitive farmers who grew corn, beans and squash. Charred traces of their food, animal bones and other refuse provide reliable evidence of their diet. Wild rice, acorns, maple sugar, fruit and nuts were also available in the area. Bones of fowl, fish and turtles were quite abundant. Of the larger mammals bear, bison, deer, wolves, foxes, raccoon, woodchuck, muskrat, and squirrel were hunted.

There were 47 cases of osteoarthritis among the 56 males aged 21 and over. After 47 years of age the incidence was 100% and the cases were more advanced in proportion to the number surviving. However, a case exhibiting Stage IV (Fig. 1A) was only 37, and the only case of vertebral ankylosis Stage V (Fig. 1B) was approximately 46



Figs. 1A and 1B. Lumbar vertebrae (K1476 and K1477) from the Crable Site in Fulton County, Illinois. These can be seen in the collection of paleopathology at Dickson Mounds State Memorial near Lewistown, Illinois.

years old. The earliest example of moderate involvement had attained an age of 24; the oldest, an individual of 75, showed extensive changes Stage IV.

Among the females, the population came to a total of 46, aged 21 or over. At age 45 or over, 100% of the women were arthritic. Of these, two were in Stage III and two in Stage IV. All the younger women only showed minor arthritic changes until the ages of 34 and 36 when Stage III lipping appeared. Of the total female population, 67% showed signs of degenerative joint disease.

The females had fewer advanced cases but there was a higher incidence of cases at an earlier age. This could have been caused by the strain and rigors of childbearing and birth in the days when the

1. The author wishes to express her appreciation to Dr. Neumann of Indiana University for guidance and suggestions in carrying out this study, and Dr. Don F. Dickson for permission to study the material in his care.

struggle for existence was so severe that a woman could expect little respite from heavy labor. Most of the work in the field, planting and harvesting, was done by the women in horticultural societies. The men usually cleared the areas and generally left the tilling of the fields to the women.

Knaggs (1926, p. 158-9) suggests that infections in connection with birth injuries may explain the greater incidence of osteoarthritis in women of childbearing age than in men. Since Indian women had little obstetrical or gynecological care this might have been a valid reason.

Dietary deficiencies certainly could have aggravated a tendency to arthritis in the Indians and the constant exposure to cold and wet was a predisposing factor. General and local vitality was depressed and lack of medication and good care for injuries were debilitating circumstances.

In Hooton's study of the skeletal remains of Indians of Pecos Pueblo (5) a greater incidence of arthritis in younger females as compared with males parallels the findings for the Middle Mississippi sample. In the 503 adult or sub-adult Pecos skeletons, 20 or 3.98% showed some signs of arthritis in the long bones and short bones and joints. Of the 20, only two were young female adults. 57.14% of the female cases were middle-aged. Among the males, 15.38% were middle aged and 84.62% were old. Cases of spondylitis deformans occurred in 13.12% of this population sample. No sub-adults (18-21) had it and of the affected males 60.42% were "old" (over 50) and 66.67% of the females.

Literature Cited

1. ANDERSON, W. A. D. 1957. Pathology. The C. V. Mosby Co., St. Louis. pp. 1252-1268
2. COMROE, BERNARD I. 1944. Arthritis and Allied Conditions. Lea and Febiger, Philadelphia. pp. 35, 462-478, 587-678.
3. DEUEL, THORNE. 1958. American Indian Ways of Life. Springfield, Illinois. pp. 33-42.
4. ILLINOIS ARCHAEOLOGICAL SURVEY, Bulletin 1, Illinois Archaeology, University of Illinois, Urbana, May 1959, pp. 33-39.
5. HOOTON, EARNEST A. 1930. Indians of Pecos Pueblo, A Study of their skeletal remains, Yale University Press, New Haven, pp. 306-13, 319-330, 332, 348-349.
6. Knaggs, R. Lawford. 1926. Diseases of the Bone. William Wood & Co., pp. 132-197.
7. Morse, Dan F. and Dickson, Don F. 1956 (April). Prehistoric Pathology, Central States Archaeological Journal, vol. 2, #4, pp. 143-150.
8. Replogle, Wayne F. 1956. Yellowstone's Bannock Indian Trails, Yellowstone National Park, Wyoming, pp. 3-5, 59.
9. Smith, Philip. 1940. Bailey's Textbook of Histology. The Williams and Wilkins Co., Baltimore. pp. 106-149.