A Transitional-Hunter-Gatherer from Kharaneh IV, an Epipalaeolithic Site from Eastern Jordan

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Abstract

The study reports on the most ancient human remains ever found in Jordan which date back to the Epipalaeolithic (Kebarian) period (Kharaneh IV). The findings of this study (patterns of dental wear lingual on the incisors, buccal on the premolars and flat on the molars) strongly suggest that this individual lived during a transitional stage between hunting and gathering and the advent of agriculture. The findings also suggest that this person used his teeth as tools.

Introduction

The site of Kharaneh IV is situated on the right bank of Wadi Kharaneh, approximately 1 Km to the southwest of Qasr Kharaneh in the east Jordanian desert (fig. 1). The site is located about 650 m above the sea level and receives an annual precipitation of less than 100 mm. The site was first surveyed by Harding (1959) and later was investigated by Garrard and Price in 1977. A small-scale excavation was undertaken in 1981 by the Jordanian Department of Antiquities under the direction of Mujahed Muheisen (Muheisen, 1983). A second season of excavation took place in the summer of 1985 with the support of the Institute of Archaeology and Anthropology at Yarmouk University.
Four occupational phases were identified in the two meters of excavation deposits. They were all of Epipalaeolithic date and had industries dominated by microlithic tools. The phases were defined from changes in the sediments, from the position of living floors on which were found concentrations of flint, human and faunal remains, mortars, pestles and hearths, as well as from changes in lithic typology and technology (Muheisen, 1988). The importance of Khareneh IV lies in the fact that it is one of the largest Epipalaeolithic sites in Southwest Asia. In addition, it contains the earliest Homo sapiens sapiens remains ever found in Jordan (Muheisen 1988, Garrard and Price 1977).

The skeleton was laid on its back with its head in an extended upright position with his left hand over the pelvis (fig. 2). Two medium size stones had been placed over its skull and two others over its legs "approximately 70 cm below the ground floor in the kebarian layer". One gazelle antler was placed on the left of the skull. For reasons unknown to the authors, the other antler was missing at the time in which the photograph was taken but was recovered later. The skeleton was brought to the Museum of National Heritage at Yarmouk University and was later placed on exhibit and is still present there. Two radio carbon dates were obtained from the fire place and gave two different dates: one is 15200 ± 450 BP and the other is 15700 ±160 BP (Lab No. KN 4193 Cologne, Germany). Diagnostic cranial and postcranial features suggest that the skeleton is that of a male approximately thirty years of age at the time of his death. Cranial and dental crown and root morphology strongly suggest that this skeleton belonged to the Caucasian racial stock (El-Najjar, 1989; Scott and Turner, 1997). This skeleton seems to have suffered from two severe pathologies Osteoarthritis in almost all of his vertebrae and extreme dental wear (both flat and oblique) in all of his teeth with no exceptions.

Pathologies

Joint disease is a general term used when the joints themselves are the major seats of degeneration. According to Steinbock (1976), in a Palaeopathological study, a case of arthritis may be diagnosed as osteoarthritis (degenerative joint disease), vertebral osteophytosis, traumatic arthritis, rheumatoid arthritis, ankylosing spondylitis, infectious joint disease or gout. Osteoarthritis is usually a disease of adults beyond middle age and can be considered as an indication of biological aging or the type of life style of a particular individual such as sitting for a long period in a flexed position or the use of his arms or legs such as in canoeing or carrying heavy load items and walking through rough terrains (Sokoloff, 1969). It is a disorder of the diarthrodial joints characterized by deterioration and abrasion of the
articual cartilage and formation of new bone at the joint surfaces. Repeated minor trauma or "wear and tear" on the joints gradually produces the degenerative changes in the articular cartilage and subsequent bone reaction. In moderately advanced cases, new bone formation takes place at the margins of the articular cartilage (Harrison et al., 1953). This marginal lipping is called osteophytosis. With progressive marginal lipping in more advanced cases, the osteophytes may become fused (fig.3).

Some workers, however (Jaffe, 1972), do not regard osteophytosis as distinct from osteoarthritis on anatomical and pathological grounds. Vertebral osteophytes may affect any portion of the spine, but marked changes occur with the greatest frequency in the lower thoracic and lumbar vertebrae reflecting the weight bearing function of this area.

Osteoarthritis of the vertebral column is extremely severe in the skeleton’s vertebrae and long bones (figures 3 & 4). It is not a new disease but has been reported in ancient and recent human skeletal populations. Osteoarthritis has been reported in early Eskimos and American Indians (Stewart, 1947), ancient Egyptians (Ruffer and Rietti, 1912), Bronze and Iron Age British skeletal series (Brothwell, 1960: Wells, 1962; Chapman, 1964) and in Roman-Byzantine skeletal populations in Jordan (Al-Muheisen & El-Najjar, 1994; El-Najjar & Al-Shiyab, 1998).

There is no absolute method of measuring the degree of severity of osteoarthritis. However, using the standards for data collection on pathological conditions (Buikstra and Ubelaker, 1994), the degree of osteoarthritis severity in the skeleton’s vertebrae was recorded as 3 (extensive spicule formation) in almost all vertebrae (fig.5) recovered, but to a lesser extent in the cervical vertebrae and with increasing severity in the thoracic and lumbar regions; true ankylosis spondylitis between the fourth and fifth lumbar vertebrae was found (fig. 3). The mandible of this skeleton is complete except for the most superior portions. The maxilla was not found. All teeth are present except the left lateral incisor, which was lost postmortem. There are no caries and there is a slight calculus on the lingual surfaces of the teeth. The chin form is bilateral and projects slightly. The muscle markings of the gonial angles are well marked with strong gonial eversion. This indicates a rather severe underbite, which most probably made it difficult for him to chew, especially tough foodstuffs. This is also suggested by the fact that the mandibular incisors and canines are well worn in a sharp buccal to lingual orientation (fig.6). The variations in the types of dental wear where we have occlusal flat wear on the molars, buccal wear on
the premolars and lingual wear (oblique) on incisor suggest that the individual lived in the Epipaleolithic period, where people were gathering and hunting but were still using mortars and pestles in the preparation of their food. The buccal oblique wear of premolars suggests that he used his premolars for the pulling and extraction of the hides of these animals for different uses, while using his incisors for the pulling and cleaning of hair. The fiber of hair/wool may have led to the abrasion on the lingual side of his incisor (Fig. 6).

Turner and Cadien (1969) reporting on the tool functions of the teeth among the Eskimos found that these people use their teeth in preference to knife blades for tearing and cutting fresh seal meat. There are several other earlier reports suggesting similar uses of the teeth among modern day Eskimos (Buxton, 1920, Ritchie, 1933), and the Aborigines of Australia, who chew dried sinew of kangaroo or emu until it is soft and elastic enough to use for binding projectile points or axe heads to wooden shafts (Gould, 1968).

The extensive and angled wear is typical of early populations (Neolithic) in the Levant (Smith, 1984) but not as severe with pulp exposure as seen in some Mesolithic specimens. The angled and rounded wear of the anterior teeth suggests the use of teeth as tools such as in the softening of leather or processing of plant fibers. According to Smith, an oblique wear plane is the pattern expected from near or actual tooth-to-tooth contact in chewing. Puncture crushing, on the other hand, should contribute to wear on the entire crown surface and lead to a flatter wear plane. According to Hiiemae (1976), animal experiments indicate that puncture crushing can be significantly increased by tough foods. This explanation predicts that more highly oblique wears result from more mechanically refined foods and is very typical of agricultural groups. It was proposed by Smith that changing from a hunter-gatherer subsistence to a diet based more heavily on ground grains, and food cooked in water, has the effect of reducing food toughness, resistance, or fibrousness, leading to a reduction in masticatory forces and the amount of food grinding done by the dentition. As tools increasingly took over the function of teeth, molar wear planes should become increasingly oblique. This may be an indirect effect due to a lessened lateral mandibular excursion responding to more refined foods or a direct effect of less puncture-crushing mastication.

Smith (1984) examined the dentitions of five series of modern and prehistoric hunter gatherers (N=298) and five series of early agriculturists (N=365) to test the hypothesis that there are systematic differences in patterns of tooth wear related to major differences in subsistence and food
preparation. Her finding showed that hunter-gatherers developed flatter molar wear as a result of the mastication of tough and fibrous food, whereas agriculturists developed oblique wear because of their softer diet.

Discussion

The nature of human adaptation during the Early and Middle Epipaleolithic is of considerable scholarly concern because this time segment (approximately 20,000 BP to 12,500 BP, Byrd, 1998) immediately precedes the earliest sedentary settlements of the Natufians (Bar-Yosef and Vella 1991).

Faunal exploitation in the Azraq Basin during the Early and Middle Epipaleolithic was focused on Gazella sp., with Equus sp. representing an important supplement (Garrard & Price, 1977). According to Byrd (1998), gazelle was the predominant animal represented in the available samples recovered from the arid areas of Jordan.

Kharaneh IV, where this skeleton was found, is one of these sites. In addition, to hunting and use of ground stones in the preparation of food, it is suggested that this person may have been a leather maker (as evidenced by the presence of gazelle horns alongside his skull and other tools such as mortars and pestles). He could have also used his central incisors for the chewing of hardened gazelle hides to soften them for use as clothing or the making of sandals or basketry.

Tooth wear is one skeletal feature that preserves direct evidence of the masticatory behavior and is strongly correlated with diet which can then be used to make inferences about diet in past human population. In addition, (Smith, 1984) indicates that tooth wear may record important information in various stages of human biological and cultural evolution, including evidence of food resources utilized by early hominids, development of fire and cooking, invention of food processing by utilizing grinding tools, invention of pottery and other refinements in the way food was processed, and the practice of crafts that involved the use of teeth as tools. Some investigators have suggested how tooth wear might reflect cultural changes in food preparation. As an example, Brace (1962) has suggested that the intensive use of grinding stones in the making of cereal food and the appearance of pottery in the Neolithic are associated with a substantial reduction in food toughness. In addition, a significant function of the teeth and probably a major cause of dental attrition in certain human groups is the use of the dentition as part of the tool assemblage (extracting hard items; e.g., in the making of baskets and
leather making of cloths and shoes). Falero (1905) cited by Molnar (1971) reports that native American Indians make use of their jaws as if they were a third hand and their incisors are real knives to them. Neumann and Di Salvo (1958) also reports that many primitive people (Indians of the Mexican Cordillera, the Peruvian Andes and in the Amazon headwaters) often use their teeth to crack and split bones and to open mollusk shells. Ethnographic accounts of several studies mentions various functions of the teeth as tools and women have been observed using their teeth for splitting willow shafts or yucca leaves for use in the manufacturing of baskets. Garret (1970) describes the use of teeth as tools among the Cree Indians of Canada in producing design patterns in birch bark by biting through the folded bark. More recently, Al-Shiyab (manuscript in preparation) also notes that the people of Ain Ghazal, (Neolithic site near Amman) used their teeth in the cracking up of bones to reach the meat and to extract the bone marrow as seen by the marks of the teeth on the bones of animals.

The change from a hunter-gatherer subsistence to a diet based on ground grains and food cooked in water should produce a reduction in food toughness, fibrousness, and resistance, and thus a reduction in the role of the teeth in the breakdown of the tooth structure while masticating foods. The product of this changes with food consistency, Bruce argued, was a change from a flat molar wear to a more oblique wear pattern. On this basis it can be suggested that this person lived during a transitional period when hunting and gathering was practiced simultaneously with the use of grinding stones, as evidenced by their presence at Kharaneh IV, and the wear pattern on his teeth.

صياد وجامع قوت من العصر الحجري القديم الأعلى
موقع الخرائنة - شرق الأردن
عبده الحليم الشيباب و محمود النجار
قسم الانثروبولوجيا، جامعة اليرموك، إربد، الأردن
ملخص
تتناول هذه الدراسة أقدم البقايا الإنسانية التي عثر عليها حتى الآن في الأردن، والتي تؤرخ إلى الفترة اللاحقة للعصر الحجري (الفرعية الكبيرة) (الخريّة 4). وقد تبين أنّ اهتمام الإنسان جاء لسانيًا في القواعد، وجنبيًا في الأضراس، وسطعًا في الطواحين. وهذا يدلُّ دلالة قوية على أن هذا الإنسان كان يعيش في المرحلة الانتقالية ما بين فترة الجمع والاتلاق وفترة ظهور الزراعة.
Fig. 1 A map showing the location of the site
Fig. 2.a A Drawing of the skeleton in site

Fig. 2.b A photograph of the skeleton before recovery.
Fig. 3 Osteoarthritis and fusion of in the thoracic vertebrae.

Fig. 4 Osteoarthritis on the head of the Humeras.
Fig. 5 Osteoarthritic lipping on the margin of the thoracic vertebral body.

Fig. 6 Dental wears on the mandible.
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References


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