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A Woman at the Edge of Agriculture: Skeletal Remains from the Elsinore Burial Site, Sevier Valley, Utah

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HUMAN skeletal remains were excavated in 1985, near Elsinore, Utah, by personnel from the Office of Public Archaeology at Brigham Young University. The site, 42Sv2111, was found by the Utah Department of Transportation (UDOT) during construction of Interstate 70 (Fig. 1). A bell-shaped pit containing scattered human skeletal remains and more than 200 corn cobs was bisected by heavy equipment. An unknown amount of material in the eastern portion of the pit was removed before construction personnel noticed the presence of human bones protruding from the western sidewall of the culvert cut. These bones were removed and a small portion of the bell-shaped pit was disturbed by probing before archaeologists were called to the scene. We found that the fine sediments containing the pit were neatly cut, leaving nearly vertical walls about four meters high and 60 meters long on either side of the trench (Fig. 2). The intact buried portion of the pit exposed in the western wall was not disturbed by the heavy equipment, and all the remaining bones and corn cobs were found to be solidly in place in positions assumed at burial. The prompt reaction by UDOT to spare the human remains from continued probing by construction personnel led to the careful recovery of human and corn remains dating to around 175 B.C. (Wilde et al. 1986; Wilde and Newman 1989). The purpose of this paper is to report on the human remains from the Elsinore Burial site.

STRATIGRAPHY

The site lay near the center of a little graben created by movement of the Elsinore Fault (Wilde et al. 1986). The graben formed a small basin that periodically held water trapped during periods of relatively heavy runoff from the eastern foothills of the Pavant Range. These infrequent ponds deposited more than four meters of sediments containing over 40 layers of silts and sands (Fig. 3). The deposits exposed in the culvert trench span most of the Holocene epoch.

The bell-shaped burial pit originated about 180 cm. below the modern ground surface, at the base of a relatively thick sand deposit that overlay a more massive stratum of blocky indurated sands. Jumbled chunks of this massive deposit were found directly overlying the sediments containing human remains at the bottom of the pit, and their orientation indicated that they were used to partially backfill the pit. The base of the bell-shaped feature contained several small roughly circular pits, one partially containing the pelvis and another the vertebrae and femur. The pelvis and associated bones and corn cobs in the northern half of the pit were found within a matrix of clayey-silt sediment that may have been poured over this portion of the burial. The clump of clayey-silt did not appear to have run down the side of the pit, as one would expect had rainwater washed the material

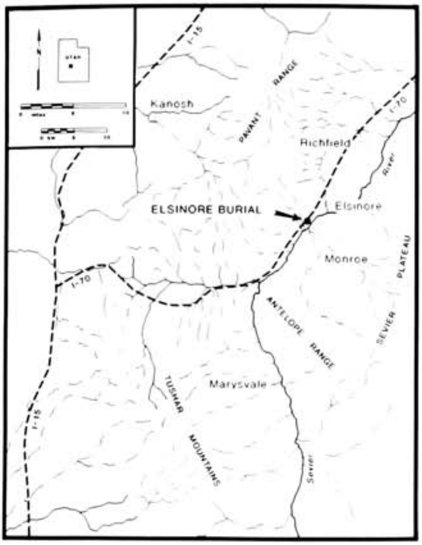

Fig. 1. Location of the Elsinore burial site.

from above while the pit was open. This fine sediment capped the bones and cobs and may have contributed to their preservation. Sediments at the base of the pit had been lightly burned prior to the introduction of either the cobs or the bones, and associated wood charcoal and unburned corn cobs were used for radiocarbon assays. A single chert biface was found in the upper fill, about 70 cm. above the bones.

CHRONOLOGY

Three radiocarbon ages were obtained from the material in the burial pit: one from partly decomposed corn cobs, and two from associated charcoal at the bottom of the bell-shaped pit (see Wilde and Newman [1989:714, Table 1] for a discussion of the dates). Ages (all uncorrected) are 2,050 ± 80 B.P. (Beta-13415, charcoal), 2,100 ± 80 B.P. (Beta-13412, charcoal), and 2,140 ± 100 B.P. (Beta-13414, corn). These are statistically equivalent (Thomas 1976:249-251; Berry 1982:9-10), and produce an average of 2,091 ± 49 B.P. (Long and Rippeteau 1974; Stuiver and Reimer 1987). This age was calibrated (Klein et al. 1982; Stuiver and Reimer 1987) to a 95% range of 375 B.C.-A.D. 25, within the Late Archaic Period in the eastern Great Basin. Midpoint of the range is 175 B.C., with an 87% probability that the target date lies between 212 B.C. and A.D. 3 (Stuiver and Reimer 1987). Naturally deposited charcoal from sediments just below the base of the pit feature returned an age of 5,130 ± 110 B.P. (Beta-13413), calibrated to 4,135-3,670 B.C. (Klein et al. 1982), and 4,170-3,700 B.C. (Stuiver and Reimer 1987). Pooled charcoal from sediments at the base of the UDOT trench were assayed at 8,050 ± 720 B.P. (Beta-18506), beyond calibration range.

HUMAN SKELETAL REMAINS

The human bones from 42Sv2111 all appear to have come from the same individual and represent the fragmentary remains of an adult female (Figs. 4 and 5). The elements present are in good condition with little post-depositional damage. Cranial fragments are missing, and dental remains are represented by a single heavily worn right upper third molar. Post-cranial elements recovered include complete right and left clavicles, a nearly complete left scapula (minus the entire coracoid process and the medial portion of the acromion process), a small fragment of the inferior angle of the right scapula, five right and five left ribs (representing: left 1, 2, 3, 4, and 12; and right 3, 4, 8, 9, and 11), two unidentifiable rib fragments, 10 complete thoracic vertebrae (numbers 1-6 and 9-12), all five lumbar vertebrae, a complete sacrum, the first coccygeal vertebra, complete right radius and ulna, two proximal hand phalanges (one complete), one middle hand phalange, two distal hand phalanges, complete right and left innominates, a complete left femur, a nearly

Fig. 2. West wall of cut: sediments comprising the burial pit fill are above and to the left of the screeners.

complete left tibia (minus a small portion of the external tuberosity), a left fibular shaft fragment, and the distal 3/4 of a left first metatarsal. The missing skeletal elements, primarily the skull and right limb bones, may have been in the eastern portion of the pit that was removed by heavy equipment during excavation of the culvert trench. We searched the backdirt pile for any signs of these elements, but the massive amount of removed sediment precluded a thorough search through the reburied material.

Two sets of thoracic vertebrae and the lumbar vertebrae, sacrum, and innominates were found articulated near the base of the pit (Fig. 4). These groups of articulated remains were not articulated with each other, however, and were found in different orientations and among other scattered elements, such as ribs and long bones. The scattered arrangement of skeletal elements, and the damaged or broken elements, suggest the bones had been disturbed after most of the surrounding flesh had disappeared, but before the remains were buried in the bell-shaped pit. The nature of the disturbance is not clear, as no cut marks, color differences, or other evidences were noted on the bones or in the pit deposits to suggest how major articulated groups had come to be disarticulated from each

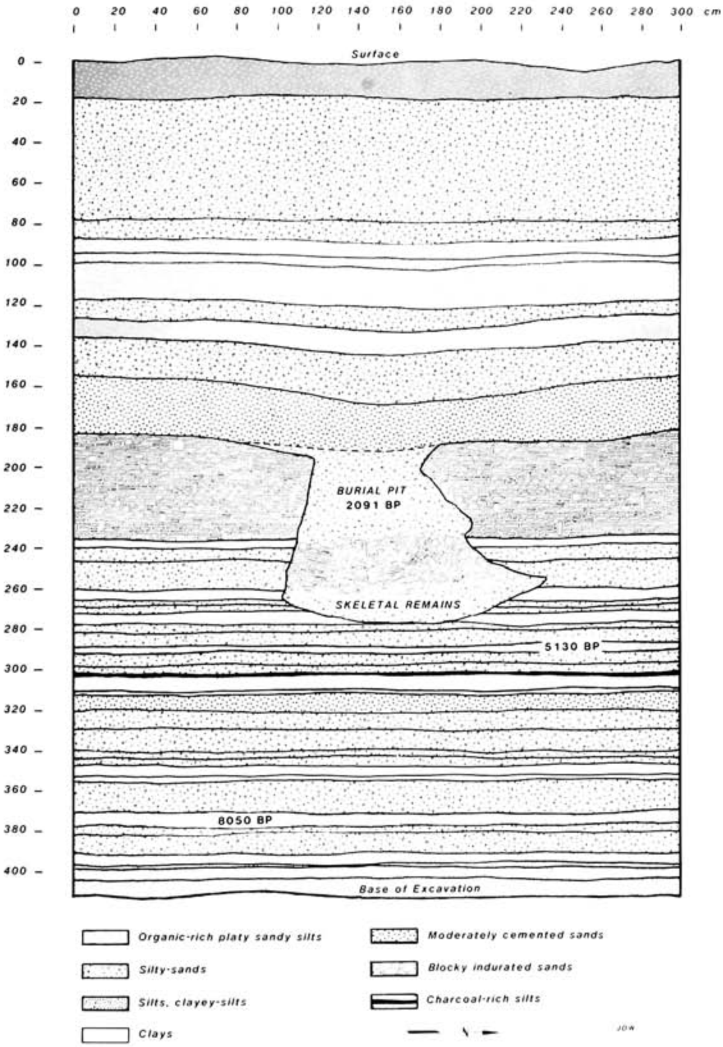

Fig. 3. Stratigraphic profile of culvert cut and bell-shaped burial pit. Date of burial pit is the calibrated average of three radiocarbon ages.

Fig. 4. Pelvis, lumbar vertebrae, ribs, femur, and phalange (upper left) associated with corn cob impressions and remains. Platy sediments between rib (center) and base of pelvis, and fine sediments in phalange pedestal are remains of possible clayey-silt cap poured over major bones and cobs at the base of the pit. Also note osteophytes along the margins of the vertebrae.

other, nor how long bones and other elements had become scattered among the ribs and vertebrae. Perhaps the body had mostly decomposed before it was deposited in the pit and buried. It bears repeating that the nearby operation of heavy equipment did not damage or loosen any of the bones we recovered in the western portion of the pit.

In general, the remains are those of a rather robust and muscular female individual around 158 cm. in height. She was probably around the age of 40, had severely worn teeth, and suffered from advanced joint degeneration caused by osteoarthritis.

ANALYSIS AND INTERPRETATION

Age Estimation

Age at death was estimated using a variety of commonly employed, reliable, and repeatable methods. These take advantage of age-related metamorphoses in various regions of the skeleton, including the pubic symphysis (Suchey et al. 1988), the sacroiliac region (Lovejoy et al. 1985), and the sternal extremity of the ribs

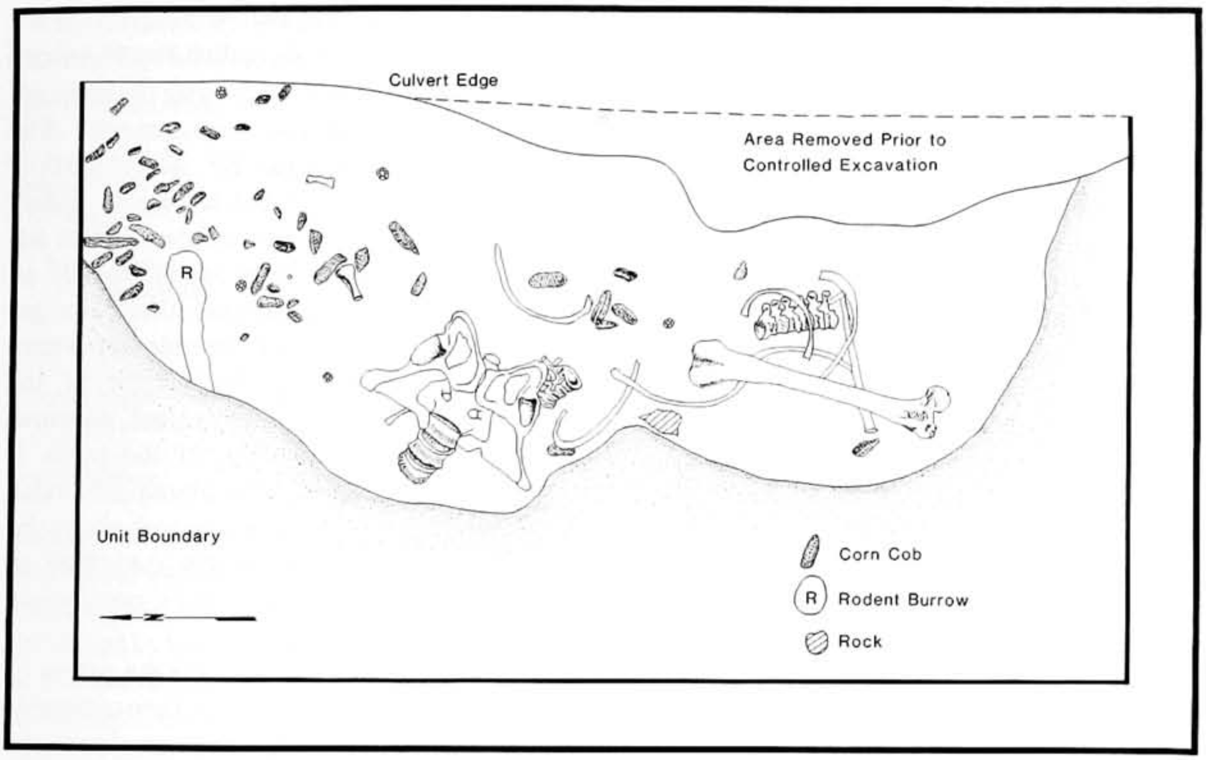

Fig. 5. Plan of pit base, showing distributions of corn cobs and human remains in excavated portion of burial pit. Several skeletal elements were removed from the portion of the pit near the culvert edge by UDOT personnel prior to controlled excavation.

(Işcan and Loth 1986).

The well-preserved pubic symphyses in the Elsinore individual allowed for the estimation of age at death using the methods outlined by Suchey et al. (1988) for morphological changes in the pubic symphysis of females. While problems of observer error, racial differences, and parturition in females have been noted (Suchey 1979; Meindl et al. 1985), this method remains one of the best estimators of adult age at death. Both pubic symphyses were inspected. Each scored as Phase IV-2, indicating an age at death estimation of 38.2 years, with a standard deviation of 10.9 years, and a 95% confidence range between 26 and 70 years of age.

The sacroiliac region was also well-preserved in both innominates of the Elsinore individual. This allowed for the estimation of age at death using the procedures outlined by Lovejoy et al. (1985) for interpreting age-related morphological changes occurring in the auricular surface of the ilium. These authors claim that the procedure is as accurate as methods involving the pubic symphysis. The morphology of the auricular surfaces of the two Elsinore innominates corresponds to individuals aged between 40 and 44 years in studies by Lovejoy et al. (1985).

The sternal rib ends allowed for the estimation of age using methods outlined for females by Işcan and Loth (1986). Işcan and Loth (1989) claimed a high reliability for sternal rib age assessment, compared to methods using the pubic symphysis. Racial differences are also noted in Işcan et al. (1987). Only seven of the Elsinore ribs were complete enough for use with this procedure. The left first, second, third, and fourth ribs correspond in morphology to Işcan and Loth's (1989) phase 5 (age 33-46). The right third and eighth ribs correspond to phase 6 (age 43-58), and the right eleventh rib corresponds to phase 4 (age 24-32).

The use of multiple indicators allows for a reliable estimate of age at death. Methods using the pubic symphysis, the auricular surfaces of the ilia, and the sternal ends of ribs all suggest an age at death of around 40 years for the Elsinore individual. This represents the best estimate of age for the available skeletal material and agrees in general with the degree of wear seen in the third molar, and with the degree of osteoarthritis observed in the thoracic and lumbar vertebrae, both of which are described below. The estimated age of 40 years suggests that the Elsinore individual lived into the later stages of life. Relatively few prehistoric hunter-gatherer or early horticultural adults found in the Great Basin, Southwest, and other regions of North America are thought to have lived much beyond 40 to 45 years of age (e.g., Ferguson 1980; Palkovich 1980; Larsen 1984; Stoddor 1987; Brooks et al. 1988).

Sex Determination

The pelvis is the most accurate post-cranial indicator of sex. Methods for sexing the pelvis fall into two categories (Phenice 1969): visual criteria and measurements. Sex was determined for the Elsinore individual using methods from both categories. Inspection of the innominates and sacrum reveal typical female morphologies (see Phenice 1969; Stewart 1979; Krogman and Işcan 1986). These include a broad and gracile pelvis, a wide and shallow sciatic notch, a deep and broad pre-auricular sulcus, an elliptical and broad pelvic inlet, a short and broad sacrum with marked curvature at S1-2 and S2-5, an obtuse subpubic angle, subpubic concavity, the presence of a ventral arc, the presence of a ridge along the medial aspect of the ishcio-pubic ramus, and a long pubis. Each of these morphological characters suggests the pelvis is female.

Measurements were also recorded for the left innominate using methods outlined by Washburn (1948). These allow sexing using the ischium-pubis index based on two measurements. The index has been criticized for its subjectivity (Stewart 1979:111-112), but it remains widely used and is apparently successful. Current sex distributions using the index are based only on white and black populations; there are no published distributions for the index of Native American populations. The length of the ischium in the Elsinore individual measures 94.54 mm., and the length of the pubis is 102.32 mm., providing an ischium-pubis index score of 108.28. This value lies well above the range for males, and is within the range of females for both white and black populations (Washburn 1948).

Metric sex determinations for the pelves of Native Americans have not yet been reported. However, some methods have been developed for Asian populations. Kimura (1982) used discriminant function analyses to estimate sex from a sample of Japanese pelves of known sex. His measurements included pubic length, ischial length, and the iliac width (maximum breadth), allowing accurate discrimination of sex in 96.70% of the cases. Similar measurements of the Elsinore individual's left innominate yield a discriminant score of minus 64.902, which falls well below the female/male boundary of 57.136, and indicates that the individual was female.

Stature Estimation

The best elements for calculating stature are the femur and tibia. Estimates based on these are presented in Table 1. Stature is estimated using methods developed by Fully and Pineau (1960), Genovés (1967), and Trotter (1970). Each of these formulae have their own merits and deficiencies. The Fully and Pineau method allows for the use of the lumbar vertebrae in

Table 1
STATURE ESTIMATES OF ELSINORE BURIAL

Based on Formula From:	**Estimates in cm.**
Fully and Pineau (1960)	
Formula 1 (femur)	154.514
Formula 2 (tibia)	160.950
Genovés (1967)	
Female (femur)	156.968±3.816
Living stature	154.468
Female (tibia)	162.517±3.513
Living stature	160.017
Trotter (1970)	
White female (femur and tibia)	161.203±3.550
Age corrected	160.138
Black female (femur and tibia)	157.622±3.280
Age corrected	156.557
Overall Average	**157.774**

stature estimation, but is not based on a Mongoloid population and does not take into account any sex differences. The formulae developed by Genovés are somewhat more useful in this case because they are based on measurements taken on an "indigenous" Mexican population, rather than on white or black populations. However, these formulae are not completely appropriate for estimating the stature of North American native populations because the Mexican sample was unusually short (Bass 1987: 28; Ubelaker 1989:62). The Trotter formulae are probably the most reliable but are based on white and black populations and as such are not entirely appropriate. In any case, the average of these estimates suggests that the Elsinore individual was around 158 cm. in height.

Third Molar

The extremely heavy wear on this tooth makes identification difficult, but several factors contribute to its classification. The tooth is identified as a right upper third molar because of the fusion of its roots retaining the expression of three roots, the lack of an interstitial wear facet on the distal surface of the enamel, and the cusp configuration. The heavy wear prohibits metrical assessment of the crown and prevents the scoring of many occlusal morphological traits. Morphological traits that are scored follow procedures outlined by Turner et al. (1991). Scorable traits include the lack of an enamel extension on the buccal aspect of the tooth, a root number of one, the lack of a congenitally absent right third molar, the absence of a significantly large parastyle (it is possible that a small one may have existed but was removed by the extreme wear exhibited in the tooth), a radical number of three, and the absence of a peg-shaped third molar.

Several pathologies were also noted on the molar. One very slight linear enamel hypoplastic defect is visible on the distal surface of the crown, measuring 2.56 mm. above the cemento-enamel junction. The location of this defect corresponds to an insult occurring around 10-14 years of age (Ubelaker 1989). One large cervical neck cary was noted on the lingual surface, measuring 2.9 mm. in diameter. No calculus is apparent on the tooth. Wear is extreme, corresponding to a wear degree of 7 (Hall and German 1975). Wear form is notched and directed anterior-lingually.

While the dental pathological evidence here is scanty, it follows a general pattern known for agriculturalists. Studies have shown that greater frequencies of caries (e.g., Turner 1979; Molnar and Molnar 1985; Powell 1985), oblique wear (e.g., Smith 1984; Schmucker 1985), and hypoplasia (e.g., Goodman et al. 1984; Goodman and Armelagos 1985) are associated with the transition from a mixed hunting and gathering economy to one with heavy reliance on agriculture. This higher incidence of pathologies has been attributed to a myriad of causes generally subsumed under nutritional- and disease-related physiological stresses. While groups with both kinds of economies certainly suffered these kinds of stresses, those with early horticultural economies seem to have endured more frequent and widespread stress than did those with more generalized diets (Powell 1985; Cohen 1989).

Post-Cranial Metrics and Non-Metrics

Metric assessment of the post-cranial skeleton utilized standard measuring procedures and equipment. All measurements listed in Table 2 follow the procedures outlined by Bass (1987), unless otherwise noted. The post-cranial skeleton was also evaluated for nonmetric traits following the methods outlined by Finnegan (1978). Those present include exostosis in the trochanteric fossa of the left femur, a medial squatting facet on the left tibia, an acetabular crease and a pre-auricular sulcus in both innominates, and an accessory sacral facet in the right innominate. Traits not present include Allen's fossa, Poirier's facet, plaque, a hypotrochanteric fossa, and a third trochanter in the left femur. We also noted the absence of a lateral tibial squatting facet in the left tibia and the absence of a suprascapular foramen and circumflex sulcus in the left scapula.

Post-Cranial Pathology

We saw evidence of osteoarthritis throughout the post-cranial elements of the Elsinore skeleton, particularly in the vertebral column. Osteoarthritis is the "gradual alteration of the articular cartilage and articular surfaces of the bone as a consequence of long-term mechanical stress, repeated minor irritation of the cartilage, or disruption of circulation of the blood to the area" (Ubelaker 1989:108), or, the "extremely common, progressive, chronic, noninflammatory disease of the diathrodial joints which causes increasing disability with advancing age" (Merbs 1983:16). Osteoarthritis, or degenerative joint disease (White 1991:350), results in the destruction of the articular cartilage in a joint and the formation of osteophytes, or bony projections, around the edges of the articulating bones. The osteoarthritic sequence of changes (Merbs 1983) usually begins with porosity of the joint surfaces, followed by the growth of osteophytes. It might then progress into eburnation, as bone-on-bone friction polishes a portion of the articulation surface.

Porosity, osteophytes, and eburnation were scored as present or absent on joint surfaces on all elements in the present axial skeleton (Table 3). Porosity occured predominately in the diathrodial and costovertebral joint surfaces, although some porosity was seen on the articular surfaces of the vertebral bodies. Porosity in the vertebral bodies is rare, but can occur in severe disk degeneration (Ortner and Putschar 1981: 430). Two erosive lesions, one on the inferior body of the first lumbar vertebra and the other on the superior body of the third lumbar vertebra, have been identified as Schmorl's nodes (Fig. 6). These result from pressure erosion relating to disc degeneration and possible disc herniation (Ortner and Putschar 1981:430). The noted porosity occurs in association with these two erosive lesions.

Osteophytes occur more often and to a greater degree on the superior and inferior articular surfaces of the vertebral bodies than on any other joint surfaces. The greatest expression in the Elsinore individual is seen in the lumbar vertebrae, with an average score of 2.2 (see Stewart 1958). Reference to Stewart's osteophytic and age graphs suggests that only an individual of relatively advanced age would show this degree of osteophytosis.

Eburnation polish was seen on the superior and inferior diathrodial joint surfaces in almost all cases, but one instance is illustrated in Figure 7 of polish on the surfaces of the left superior costovertebral joint of the first thoracic vertebra of the Elsinore individual. Eburnation was also seen on the corresponding left first rib. Eburnation on costovertebral joint surfaces is rare (Ortner and Putschar 1981:430). We saw no evidence of eburnation on the diathrodial joint surfaces of the vertebral bodies.

The effects of degenerative joint disease were also noted throughout the rest of the post-cranial skeleton. Slight osteophytic development

Table 2
OSTEOLOGICAL MEASUREMENTS[a] AND INDICES OF ELSINORE BURIAL[b]

Element and Description	Right	Left
Clavicle		
Maximum length	144.36	143.86
Sagittal thickness[c]	10.36	10.40
Vertical thickness[c]	8.80	8.24
Circumference of mid-shaft	31.00	31.00
Robustness index	21.47	21.55
Scapula		
Maximum length		151.00
Maximum breadth		98.14
Scapular index		64.99
Length of supraspinous line		62.22
Length of infraspinous line		112.10
Glenoid cavity length[d]		38.76
Glenoid cavity breadth[d]		26.00
Radius		
Minimum circumference of shaft	39.00	
Anterior-posterior mid-shaft[e]	11.20	
Mediolateral mid-shaft[e]	14.30	
Circumference of mid-shaft[d]	39.00	
Ulna		
Maximum length	254.00	
Physiological length	225.00	
Minimum circumference of shaft	38.00	
Caliber index	16.89	
Anterior-posterior mid-shaft[c]	16.58	
Mediolateral mid-shaft[e]	12.64	
Transverse diameter at crista[d]	13.88	
Maximum diameter of the capitulum[d]	17.62	
	Anterior	**Posterior**
Vertebrae		
Height of centrum[c]		
Thoracic 1	14.26	15.28
Thoracic 2	16.64	17.38
Thoracic 3	18.16	18.24
Thoracic 4	19.26	19.10
Thoracic 5	18.84	19.30
Thoracic 6	19.64	20.12
Thoracic 9	20.90	20.30
Thoracic 10	21.98	20.50
Thoracic 11	20.90	20.50
Thoracic 12	20.98	20.10
Lumbar 1	21.90	28.92
Lumbar 2	22.66	27.02
Lumbar 3	23.98	25.44
Lumbar 4	24.92	23.62
Lumbar 5	27.68	22.82

Element and Description		
Sacrum		
Maximum anterior length		100.02
Maximum anterior breadth		117.98
Sacral index		117.96
	Right	**Left**
Innominate		
Maximum height	209.00	207.00
Maximum breadth	156.00	153.00
Pelvic breadth-height index[e]	134.00	135.00
Length of ischium	92.39	94.54
Ischial length[c]	102.82	101.28
Length of pubis	100.50	102.32
Pubic length[c]	72.60	73.34
Ischium-pubis index	109.00	108.00
Acetabular diameter	47.72	46.28
Sciatic notch angle	52.00°	46.00°
Sciatic notch height[e]	36.00	37.00
Acetabulo-sciatic breadth[c]	35.90	36.40
Sub-pubic angle		91.00°
Femur		
Maximum length		414.00
Oblique length		409.00
Anterior-posterior mid-shaft		28.80
Mediolateral mid-shaft		25.16
Robusticity index		13.21
Circumference of mid-shaft		85.00
Subtrochanteric anterior-posterior		24.90
Subtrochanteric mediolateral		32.76
Platymeric index		76.01
Vertical diameter of head		40.64
Maximum diameter of head[d]		40.64
Bicondylar width[d]		76.00
Least transverse diameter of shaft[d]		24.92
Tibia		
Maximum length		363.00
Anterior-posterior mid-shaft[e]		29.58
Mediolateral mid-shaft[e]		22.16
Anterior-posterior nutrient foramen		35.32
Mediolateral nutrient foramen		23.04
Platycnemic index		65.23
Least Circumference of shaft[d]		73.00
Fibula		
Maximum diameter mid-shaft[c]		15.96
Circumference mid-shaft[c]		46.00

[a] All measurements are in millimeters.
[b] Measurements and indices from Bass (1987) unless otherwise noted.
[c] Jones (1929).
[d] Giles (1970).
[e] Montagu (1960).
[f] Kimura (1982).

Table 3

OSTEOPHYTOSIS, EBURNATION, AND POROSITY OF THE AXIAL SKELETON

Location	Vertebra	Osteophytosis	Expression[a]	Eburnation	Porosity
Amphiarthrodial Vertebral Joint Surface: Superior/Inferior					
	T1	+/+	2	-/-	-/-
	T2	-/-	1	-/-	-/-
	T3	+/+	1	-/-	-/-
	T4	-/+	0	-/-	-/-
	T5	-/+	0	-/-	-/-
	T6	-/-	2	-/-	-/-
	T9	+/+	2	-/-	-/-
	T10	+/-	2	-/-	-/-
	T11	+/+	1	-/-	-/-
	T12	+/-	3	-/-	-/-
	L1	+/+	1	-/-	-/+
	L2	+/+	2	-/-	+/+
	L3	+/+	3	-/-	+/-
	L4	+/+	3	-/-	-/-
	L5	+/-	2	-/-	-/-
	S1	+	2	-	-
Diathrodial Joint Surfaces: Superior/Inferior					
	T1	-/+		+/-	+/-
	T2	-/-		-/-	+/-
	T3	-/-		-/-	-/-
	T4	-/+		-/+	-/+
	T5	+/+		+/-	+/+
	T6	+/+		+/-	+/+
	T9	+/+		-/-	-/-
	T10	-/+		-/+	+/+
	T11	+/-		+/-	+/-
	T12	-/-		-/-	-/-
	L1	-/-		-/-	-/-
	L2	-/-		-/-	-/-
	L3	+/+		-/-	+/-
	L4	+/+		-/-	+/-
	L5	+/+		-/-	+/+
	S1	+		+	+
Costovertebral Joint Surfaces: Transverse Processes/Body					
	T1	-/+		-/+	-/+
	T2	-/+		-/-	-/-
	T3	-/+		-/-	-/+
	T4	-/+		-/-	-/+
	T5	-/-		-/-	-/+
	T6	-/+		-/-	-/+
	T9	+/+		-/-	-/+
	T10	+/+		-/-	-/+
	T11	/+		/-	/+
	T12	/+		/-	/+
Costovertebral Joint Surfaces: Rib Head/Rib Tubercle					
	Right 1	+/-		+/-	+/-
	Right 2	-/-		-/-	-/-
	Right 3	-/-		-/-	-/-
	Left 3	+/-		-/-	-/-
	Right 4	-/-		-/-	-/-
	Left 4	-/-		-/-	-/-
	Left 8	-/-		-/-	+/-
	Left 9	+/-		-/-	-/-
	Left 11	+		-	+
	Right 12	-		-	+

[a] Scored following methods outlined by Stewart (1958).

Fig. 6. Lesions identified as Schmorl's nodes on the vertebral bodies of the first and third lumbar vertebrae.

was seen on the articular surfaces of the proximal ulna, the distal radius, the distal femur, the distal tibia, the proximal first metatarsal, the acetabula, and the glenoid fossa of the left scapula. Moderate porosity occurs in the roofs and floors of both acetabula, the inferior border of the left glenoid fossa, and the distal articular surface of the ulna. Severe porosity was seen on the medial and lateral articular surfaces of both clavicles. These observations, along with the eburnation seen in the costovertebral joint of the first thoracic vertebrae and left first rib, suggest that the most severe osteoarthritis occurred in the lumbar vertebrae and upper thorax.

CONCLUSIONS

Some aspects of the importance of the Elsinore Burial have been discussed in Wilde and Newman (1989). Most center on the early corn dates and the corresponding implications of Late Archaic horticulture in the eastern Great Basin. Corroborations of these early dates have recently come from sites in southern Utah (corn at Alvey Site in Glen Canyon, ca. 350 B.C., [Geib 1990]; at Hog Canyon, near Kanab, ca. 580 B.C. [Schleisman and Nielson 1988]; at Cottonwood Cave, western Colorado, ca. 270 B.C. [Mark Stiger, personal communication

Fig. 7. Eburnation polish reflecting light from the left superior costovertebral joint surface of the first thoracic vertebra.

1990]; and at Three Fir Shelter, in northern Arizona, ca. 1,950 B.C. [F. E. Smiley, personal communication 1990]).

The Late Archaic human remains from Elsinore are somewhat more enigmatic. Their partial disarticulation and random distribution in the bottom of the pit suggest a rather careless, or possibly disturbed, burial. The intact matrix of clayey-silt covering most of the bones and cobs shows that any disturbance happened prior to their interment. None of the random distribution and disarticulation of the skeletal elements is attributable to the heavy equipment that removed the eastern portion of the bell-shaped pit. The bones and cobs in the western portion of the pit were exposed by careful excavation from above, and all were found firmly in place, in consolidated sediments that were not disturbed to any extent during UDOT excavation of the culvert trench.

The recovered skeletal elements were purposely buried, as suggested by the order and orientation of backfill dirt in the pit above them. About 200 corn cobs, none with kernels, were also buried with the bones. These suggest that one of the last uses of the bell-shaped pit was for trash disposal, adding more evidence for a rather careless interment.

The remains themselves have more to tell us. The person was a rather robust female around the age of 40 years. Her teeth were highly worn. She apparently lived a relatively healthy life, but with at least one physiologically stressful event that may have occurred just prior to puberty. She undoubtedly was at least hampered in movement, if not crippled, in later years by her arthritis. The amount of porosities, osteophytic development, and eburnation on several vertebral and other articulating surfaces suggests she moved with pain. Perhaps her horticultural lifestyle contributed to this degenerative state.

Recent evidence suggests that excessive amounts of joint damage and eburnation of articulating surfaces may be related to particular kinds of food storage. Brooks et al. (1990) described several cases of eburnation on skeletal remains from Stillwater Marsh, in western Nevada. They suggested that the causes of such wear damage may be partly related to a mycotoxin produced by spores of *Fusarium*, a parasitic fungus that can attack corn and grass seeds stored in cool and wet environments. Bell-shaped storage pits very likely provided ideal conditions for *Fusarium* proliferation. The mycotoxin destroys the hyaline cartilage between joint surfaces, leading to bone-on-bone friction, eburnation, and joint damage (Nesterov 1964).

The effects are exacerbated by daily stress and strain on joints caused by repetitive activities (Merbs 1983). Women in horticultural societies often bear the bulk of daily repetitive work, such as corn grinding, child lifting and carrying, hide scraping, sewing, and water hauling. The Elsinore woman obviously worked hard, judging from the relative robusticity of her bones and muscle attachments. Perhaps she often carried heavy loads with a tumpline, which may have contributed to the more severe osteoarthritis in her lower back and upper thorax.

In sum, then, the human remains from the Elsinore Burial site may exhibit conditions that could have been major problems to early horticultural people. Storage of wild or domesticated plant seeds, as possibly evidenced by both the corn cobs and the bell-shaped pit, allowed a new way of life. It also might have presented these Late Archaic peoples with increased health risks, particularly in the form of restricted mobility in later life. We might infer from the Elsinore woman that societal changes were underway around 2,000 years ago to accommodate partly immobilized older people, who may have been unable to care fully for themselves.

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