CHRONIC ILLNESS AND DISABILITY IN A PREHISTORIC NORTHERN CALIFORNIA POPULATION: EVIDENCE OF CARE FROM COMMUNITY AT THE YAKMUY 'OOYÁKMA-TKA SITE (CA-SCL-215)

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This is a preliminary report based on a recent skeletal biology analysis of a small ancestral Muwekma Ohlone cemetery population at the Yakmuy 'Ooyákma-tka site (CA-SCL-215) in San Jose, California. In this population, two burials showed signs of extensive osteomyelitic infection, indicating that these individuals had chronic illnesses. Based on previous studies regarding the bioarchaeology of care, I have evidence that these two individuals were cared for by members of their community, as they clearly suffered from their conditions, and likely could not maintain basic life functions without assistance from others. This project was conducted in collaboration with the Muwekma Ohlone Indian Tribe.

The CA-SCL-215 site (Figure 1) was named Yakmuy 'Ooyákma-tka by Muwekma Ohlone tribal leadership. It translates to "Place of the East Ridge Site" in the Muwekma Ohlone native Chochenyo language. This was a small cemetery in eastern San Jose, California, that had a minimum number of 27 individuals, and 10 isolated human elements that were recovered by the tribe and their archaeological team during the construction of residential homes. The project initially began with conditions that were not ideal: the fieldwork and monitoring started with an absence of the Muwekma Ohlone Indian Tribe (MOIT), despite the extremely close proximity to a known MOIT cemetery site (CA-SCL-327). When construction grading and trenching began, members of William Self Associates, Inc. (now PaleoWest) were the sole monitors of the construction activities. It was not until after the first four inhumations were impacted that the MOIT finally gained stewardship over the osteological monitoring. Once this occurred, they hired me to work as a tribal representative, archaeological monitor, and osteologist. From there, I inherited the responsibility to conduct the preliminary and formal osteological analysis and report.

BACKGROUND

Burials 14-A and 15 from this site were unique in that they had evidence of systemic osteomyelitis, an infection in bone that usually originates in the bloodstream or soft tissues after injury or primary infection but can also occur when the bone is traumatized and exposed to pathogens. In contemporary clinical settings, osteomyelitis is curable with intravenous antibiotics and surgical procedures (Mayo Clinic 2020). However, such treatments were not available for prehistoric populations, thus individuals like Burials 14-A and 15 experienced the disease as a chronic and likely debilitating condition. Even in present-day contexts, severe or untreated osteomyelitis infections can necessitate surgical amputation of body parts, or cause death (Cierny et al. 2003). While I cannot make a blanket assessment of the overall prevalence of disease in this population from two burials, the extent and duration of the osteomyelitis infection seen in Burials 14-A and 15 may indicate realities that necessitated care from others.

Multiple bioarchaeological studies have discussed chronic disease or serious injury as having both individual and collective implications (Gardner et al. 2018; Tilley 2017; Tilley and Schrenk 2017; Willett and Harrod 2017; Worne 2017). Furthermore, through the analysis of human remains and the interpretation of disability—placed in context of what is known about the lifeways of precontact south San Francisco indigenous communities in which the individuals lived—we can attempt to piece together narratives of caregiving activities (Tilley and Schrenk 2017). Although it is important to consider that varying factors can intensify or ameliorate the ways in which an individual experiences illness, attempts can still be made to

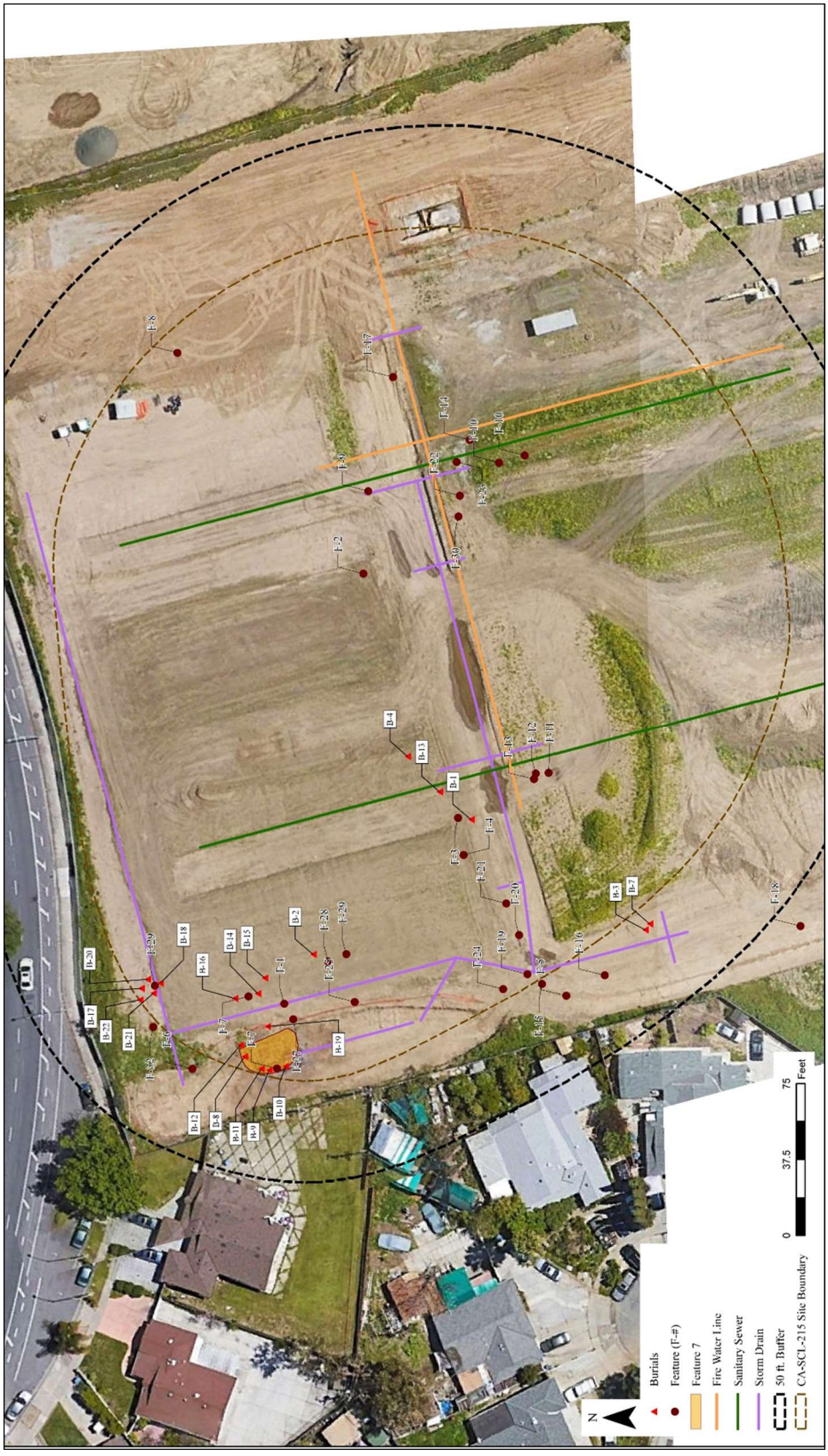

Figure 1. Aerial image of CA-SCL-215 burial and feature distribution (courtesy of PaleoWest Archaeology, Walnut Creek, California).

estimate the ways in which one's ability to function or participate in common activities were likely compromised by chronic conditions (Tilley 2017). Moreover, an individual surviving in a community despite these limitations indicates empathy or a willingness to give care, potentially shedding light on broader community beliefs. Nonetheless, there are constraints in such discussions as the experience of disease involves complex entanglements of physical pathological features, psychology, milieus, and physical environments.

METHODS AND RESULTS

The overall population sample from the Yakmuy 'Ooyákma-tka site included 27 individuals and 10 isolated human remains. To the best of my ability, considering that several individuals were incomplete or missing vital elements, sex, age, and stature estimation were based off osteological standards involving observation of aggregate macro-cranial and sub-cranial features, dental attrition, and osteometrics (Bass 1994; Buikstra and Ubelaker 1994; Genovés 1967; Lovejoy 1985; Lovejoy et al. 1985). The tools used in the laboratory included sliding calipers, spreading calipers, a mandibulometer, an osteometric board, and a lighted magnification glass. Ten individuals were estimated to be male, six as female, and 11 of indeterminate sex. Each burial ranged in completeness: 10 individuals were less than 20 percent complete, eight individuals were ~20-30 percent complete, four individuals were ~50-75 percent complete, and six individuals were ~80-90 percent complete. The age-at-death demographics were as follows: three individuals were 6.5 years or less, four individuals were ~20-35, 11 individuals were ~35-45, three individuals were ~45+, four individuals were adults of indeterminate age, and two were juveniles of indeterminate age.

Findings for Burial 14-A

Burial 14-A was determined to be male, approximately 5'4" tall, and 20 to 30 years old at death. Through accelerator mass spectrometry (AMS) dating, the individual in Burial 14-A was determined to have died about 1,193 years ago. He was interred with another individual—Burial 14-B—in a face-down extended position. These were the only individuals buried in this position, but due to many decades of taphonomic processes—including a historic cattle ranch and orchard, contemporary encampments, and development—several of the burials had been damaged or disarticulated to the extent that ascertaining primary position was impossible.

Many skeletal elements of Burial 14-A had a periosteal reaction that indicated an osteomyelitis infection. The etiology of the infection in this individual was indeterminate, which is not uncommon as osteomyelitis often originates through an infection in the bloodstream or soft tissues and spreads to bone. The elements of Burial 14-A that displayed evidence of osteomyelitis included the clavicles, mandible, right humerus, radius, ulna, ribs, right scapula, and left femur. The mandible had several cloaca, which are pus drainage sites that form in infected bone. There was also evidence of a severe middle and inner ear infection, which resulted in lytic lesions perforating the internal auditory meatus, as well as porotic lesions on the mastoid indicating mastoiditis. While the original site of the osteomyelitis infection cannot be ascertained, it is possible that it began as an ear infection or mastoiditis that did not resolve on its own, and then spread.

Findings for Burial 15

Burial 15 was determined to be a female who was approximately 35 to 45 years old at death. She was buried in a tightly flexed, north-facing position, as were seven of the other 27 individuals interred at the site. AMS dating of Burial 15 determined that this person died approximately 1,095 years ago. As with many of the other burials at this site, the condition of this individual was poor and highly fragmented due to taphonomic processes.

The etiology of the osteomyelitis infection of Burial 15 could also not be ascertained, but there was a lesion perforating the superior-posterior sacrum, which was slightly over a centimeter in length and was evidence of a traumatic injury—such as penetration by a projectile. This lesion had smooth edges, indicating healing of the bone, but could have been an injury that introduced pathogens into the bone. On the interior-dorsal wall of the sacral canal, I further observed a secondary lesion in the form of a tunnel in the cortical bone, with a trajectory spanning laterally from the lesion—indicating the migration of an active infection.

Like Burial 14-A, most of the skeletal elements of Burial 15 showed periosteal reactions that were evidence of osteomyelitis. These elements included the *os coxae*, mandible, several cranial bones, thoracic vertebrae, ribs, sacrum, femora, tibiae, and the right fibula. The left and right temporal crania also indicated mastoiditis, and I observed multiple cloaca on the *os coxae*.

PRECONTACT MUWEKMA OHLONE LIFEWAYS AND SUBSISTENCE

After considering the extent and chronic nature of these individuals' infections, it is important to take into account the lifeways and subsistence practices of precontact Muwekma Ohlone, to better understand the impacts of a serious, long-term illness. A number of activities were common for precontact Native Californian and Ohlone communities (Bates 1982; Bean 1975; Bean and Vane 1978; Davis 1992; Leventhal et al. 2009; Wallace 1978). Some included the production of technomic, sociotechnic, and ideotechnic material culture. A variety of tools needed to be manufactured for food procurement and processing, including chert and obsidian arrow points, knives, and scrapers. In precontact Muwekma Ohlone subsistence practices, men tended to be hunters of large and small game, and women would participate in rabbit drives and fishing, as well as food processing and cooking (Wallace 1978). While food procurement was somewhat gendered, both men and women participated in fiber manufacture necessary for basketry, fishing nets, and more. Also common was the production of elaborate ornamentation and regalia involving careful work with abalone and *Olivella* shell, feathers, plant fibers, and deer skin (Bates 1982). Dancing was also significant for religious ceremonies and other purposes, and sometimes involved traveling to culturally significant natural sites—like springs and rock formations—to perform such rituals. Understanding these common activities leads to the question: How does a chronic osteomyelitis infection affect a person's ability to participate?

DISCUSSION AND CONCLUSION

In contemporary medical data, symptoms of chronic osteomyelitis include fever, chills, sweating, irritability, fatigue, nausea, pain, redness and swelling around the affected bones, lost range of motion, pus-draining lesions in the flesh, loss of blood supply to bone, bone necrosis, and death (Mayo Clinic 2020; Medical News Today 2020). The realities of this disease could have led to the exclusion or inability of the afflicted individual to participate in both collective and autonomous activities.

The time frame involving the systemic spreading of osteomyelitis varies from one individual to another. However, based on the extent of the infection in Burials 14-A and 15, these individuals clearly suffered from the condition for quite some time. At the early onset of infection and symptoms, Burial 14-A was likely still able to participate in regular activities, such as hunting, tool production, dance, and travel. As his infection spread and his symptoms increased in severity, he may have slowly lost the ability to participate in some of the more physically demanding activities. The greatest extent of the infection was in his mandible and temporal bones and, unless the infection spread to his brain, it is possible that he maintained his ability to participate in less strenuous activities. Nonetheless, he would have likely needed care in the form of nutritional provision, possible treatment of open wounds, and medicinal treatment of symptoms.

Burial 15's osteomyelitis infection was more severe than that of Burial 14-A. But, like Burial 14-A, she may have initially been able to participate in regular activities during the early stages of her infection. Yet, over time, it is likely that she was unable to participate in the more physically strenuous activities. In

the final stages of her infection, she may have been almost entirely incapacitated. This could have had an impact on her self-esteem and status in her community and, perhaps more tangibly, it would have required increasingly heavy demands from family or community members to provide her with food, water, and bodily care like bathing and treating wounds, or providing other medical aid to help with pain and other symptoms.

Further considerations concerning the impacts of the quality of life include the visible symptoms of the disease: lesions draining pus, swelling, and disfiguring disabilities caused by necrotic bone. These individuals' suffering was likely very visible to the community, which may have led to stigmatization from some in the community or internalized stigma, further impacting care provided or care accepted (Willett and Harrod 2017). Nevertheless, given the activities necessary for survival and community involvement, Burials 14-A and 15 required the help of family or community members to have persevered as long as they did with such a painful and debilitating condition.

Additionally, a study by Gardner et al. (2018) of the prehistoric Muwekma Ohlone Yukisma Mound analyzed stable carbon and nitrogen isotopes from bone collagen to determine whether there were significant differences between the diets of individuals with disabling conditions and other adults in the community. The study revealed no significant dietary differences. Although this form of analysis could not be conducted for the East Ridge Site burials, it is possible that these two precontact Muwekma Ohlone communities operated similarly with regard to food provision. The Yukisma Mound study also discussed burial-associated artifacts and burial location as potential indicators of forms of communal inclusion or exclusion, based on disability (Gardner et al. 2018). If I apply these concepts to Burials 14-A and 15 of the East Ridge Site, I can say that these individuals were not interred in locations that were segregated from the rest of the burial population, nor was there a significant difference in burial-associated artifacts. As a whole, these observations can be further indicators of collective integration and caregiving culture in this community.

Other physical anthropology studies of California Native American ancestral populations have discussed interpersonal violence or traumatic injury, especially in the contexts of complex intra- and inter-societal shifts and potential competition for resources (Lambert and Walker 2015; Walker 1989). My discussion deviates from that dialogue, shifting the analytic gaze towards chronic disease, and illness as a complex phenomenon with individual and collective implications. The field of the bioarchaeology of care has been expanding in fascinating ways, and although this preliminary study had many limitations—including lack of accessibility to advanced laboratory technology and additional forms of testing and analysis—hopefully this study can serve as a small contribution to that growth.

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