

Mycenaean Occupants of Ancient Kallithea:
Understanding a Population's Health, Culture,
and Lifestyle Through Bioarchaeological Analysis

by

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Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Abstract

The Mycenaean cemetery at Kallithea Laganidia is the first comprehensive study of a cemetery sample from the periphery of the Mycenaean world. Previous studies have focused primarily on remains from palace centers. Even though it is known that the Mycenaean population of Achaea, very little is known about this more rural population.

Archaeologically and bioarchaeologically the region of Achaea has been neglected by formal and organized research, and as a result almost nothing is known about the population. This project has three aims. First, to provide new demographic data about sex, age, health, and the culture of these Mycenaean. Secondly, via osteological analysis, to examine the hypothesis that the social stratification indicated by the associated grave goods in the tombs is reflected in the spatial orientation of each tomb and the health status of the individuals buried in the graves. Finally, to address the issue of “orphaned” archaeological collections, excavated in rescue operations, which then languish in storage for years or decades.

The Kallithea Laganidia cemetery was in use from LHIIIA to LHIIIC and consists of one tholos and 23 chamber tombs. The tholos is a monumental high status tomb, and was in use both before and after the construction and use of the chamber tombs. Five of the chamber tombs were selected as a representative sample of the cemetery for this thesis. The tombs contained both men and women, and adults and children were represented among the tombs, indicating that they should provide a reasonable cross section of the population that buried their dead at Kallithea Laganidia.

This osteological data showed and confirmed that the status differences seen in the grave goods from the tombs are also reflected in the tombs according to spatial distribution.

The varying quality of burial offerings among the tombs of Kallithea Laganidia suggest that the tombs closer to the tholos contain burials of the socially elite, and the tombs farther away from the tholos contain burials of lower social classes. The pathology data collected, and more specifically the dental pathology data, do reflect social stratification among the sample's five tombs, particularly when looking at antemortem tooth loss and severe dental wear.

In addition, there are indications of status or behaviour differences between the sexes. Kallithean women seem to have been exposed to infection during life more often than men. Women have higher rates of infectious disease, and indications of more antemortem cranial trauma than men. Also, the presence of men, women, and children among secondary burials within these tombs suggested that there is a familial or linear tie within each tomb.

The Kallithea Laganidia cemetery has the potential to yield new and informative data about the Achaean Mycenaean population. From this small sampling of 38 burials from five tombs, already the demography and paleopathology of this peripheral group is beginning to be deciphered .

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Special thanks to Evy Papadopoulou-Chrysikopolou and Dr. Thanasis J. Papadopoulos. Their insistence to have an archaeological and bioarchaeological collaboration enabled this project to begin. Evy never failed to respond to every question I had about the excavation and archaeological material. She also provided all the excavation material I requested and more. Working with the excavator director and excavator is ideal for bioarchaeological investigations, but they have exceeded all of my expectations and I hope to continue our collaboration in the future.

I would also like to thank the Wiener Laboratory at the American School of Classical Studies, Loring Hall, and all the ASCSA regular members who I encountered during my

research. Without the Travel Grant funding from the Wiener Laboratory I would not have been able to come to Athens. This grant enabled me to not only complete my research in Athens but also focus on my thesis when I came back to Canada. The American School of Classical Studies and Loring Hall provided me a home and peers that could not have better suited my needs while living in Athens.

The University of Waterloo's Department Of Anthropology has been supporting me since the day I arrived in Canada with my Uhaul. The faculty, staff, and students provided an international home away from home. Thank you to the faculty for always checking in, being supportive, and most importantly available. Thank you Allyson Rowat for always being three steps ahead. To my Graduate and Undergraduate peers, thank you for always challenging and teaching me. Some of the most important things I have learned during my time at University of Waterloo is from them. They showed me different ways to think about and view the world.

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For my family-

My Mother, Sandra

My Brother, Benjamin

My Sister, Linda

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CHAPTER 1: INTRODUCTION

The region of Achaea is located in the northwest corner of the Peloponnesus, an area that was remote and marginal to the Greek speaking world in the Bronze Age [Figure 1.1]. Even though it has been long recognized by scholars that the Mycenaeans occupied the Achaea region, very little is known about this peripheral population. The excavation and analysis of the cemetery at Kallithea Laganidia therefore contributes significantly to our understanding of Mycenaean society at the fringes. The Kallithea Laganidia cemetery was in use from LHIIIA to LHIIIC [Figure 1.2] and consists of one tholos and 23 chamber tombs. The tholos is a monumental high status tomb, and was in use both before and after the construction and use of the chamber tombs. Five of the chamber tombs were selected as a representative sample of the cemetery for this thesis. The tombs contained both men and women, and adults and children were represented among the tombs, indicating that they should provide a reasonable cross section of the population that buried their dead at Kallithea Laganidia.

Archaeologically and bioarchaeologically the region of Achaea has been neglected by formal and organized research, and as a result almost nothing is known about the population. This project has three aims. First, I will provide new demographic data about sex, age, health, and the culture of these Mycenaeans. Secondly, via osteological analysis, I will examine the hypothesis that the social stratification indicated by the associated grave goods in the tombs is reflected in the spatial orientation of each tomb and the health status of the individuals buried in the graves. And finally, I will address the issue of “orphaned” archaeological collections, excavated in rescue operations, which then languish in storage for years or decades.

The osteological analysis of this cemetery will provide new information about the association and impact of status on skeletal biology. The location of the associated habitation site for Kallithea Laganidia is unknown, thus the cemetery is the only available source of information on this population.



Figure 1.1: Map of Greece with the area of Patras and then Kallithea Laganidia highlighted

This project is the result of collaboration between the excavator and the biological anthropologist. More commonly in Greek archaeology these two scientists conduct their research independently with little or no communication at any stage of the analysis or publication. I am fortunate to have had the full and ongoing cooperation of Evy

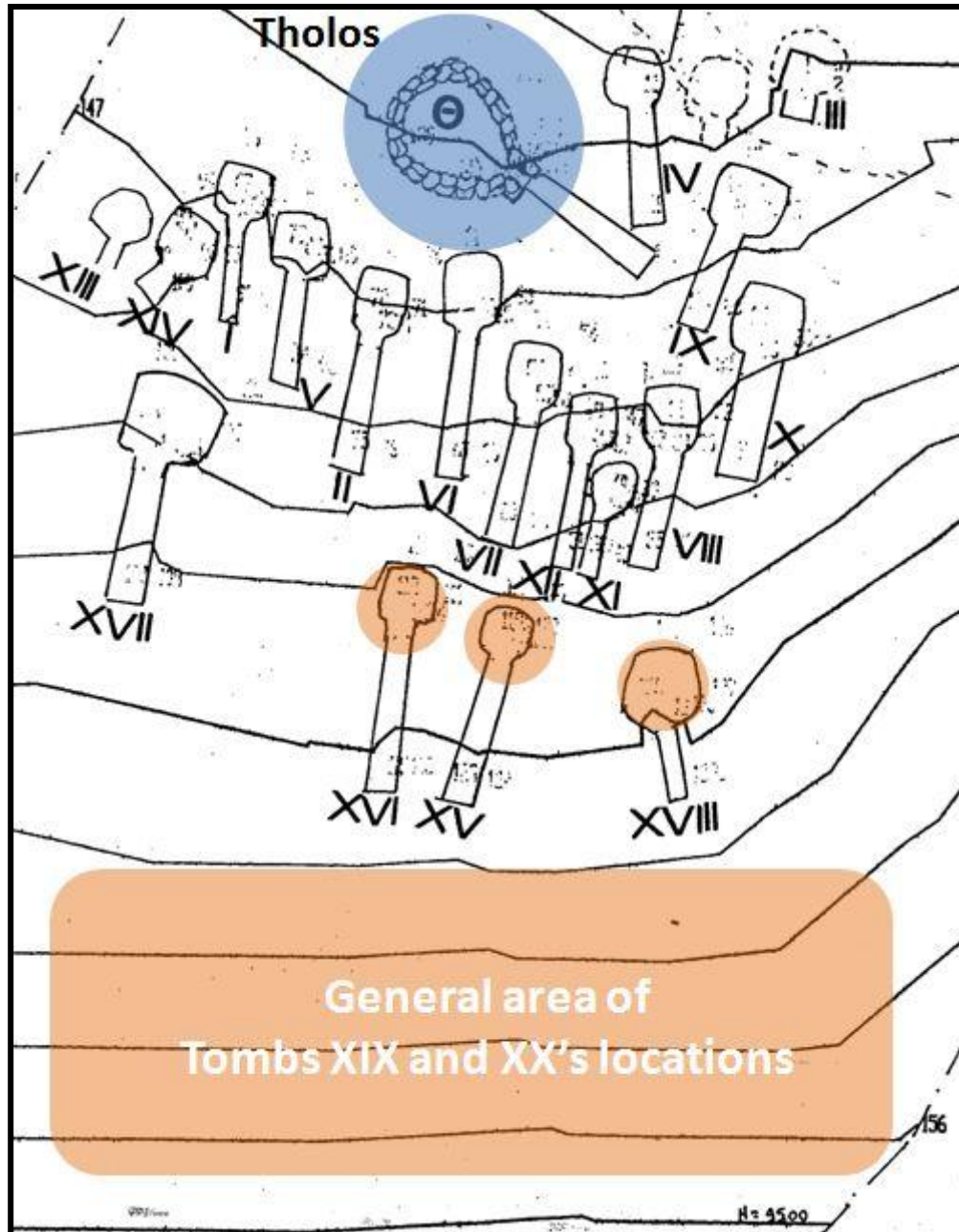


Figure 1.2: Kallithea Laganidia Cemetery Site Map

Papadopoulou-Chrysikopolou, an archaeologist completing her doctoral dissertation on this material at the University of Ioannina and Thessaloniki. Moreover, she is the daughter of Dr. Thanasis J. Papadopoulos, who excavated the site of Kallithea Laganidia from 1986 to 2002. Through him I had access to excavation notes, site plans, and the complete set of excavation

photos. This collaboration enabled both parties to exchange ideas and data immediately throughout the time I was gathering data. Perhaps the most enduring outcome of this project will be to encourage a research relationship and collaboration between future osteologists and archaeologists.

Organization of Thesis

This thesis has seven chapters beyond this introduction. The second chapter will introduce the Mycenaeans of Achaea and the bioarchaeological context of Kallithea Laganidia cemetery. In addition, this chapter presents the central hypotheses for this project. The third chapter will describe the skeletal material and provide a description of the tombs and excavation history. The methodologies utilized in addressing this project's hypothesis are described in chapter four. The fifth chapter details the paleopathology present among the Kallithea Laganidia sample. The sixth chapter explores the relationship between archaeological excavation and osteological analysis in regard to bioarchaeological progress in Greece. It further discusses the specific public issues of legislative, political, and academic stakeholders involved in studying human remains in Greece. The seventh chapter will present the results of this project. Finally, chapter eight encompasses the conclusions of these results and discusses the prospective future of Kallithea Laganidia.

CHAPTER 2: THE ACHAEA REGION OF THE PELOPONNESE

Located at the Northwestern edge of the Ancient Greek world, only recently has the region of Achaea begun to contribute toward our understanding of Greek prehistory. The Mycenaean civilization is too often defined by its large and well-known palaces like those at Mycenae, Pylos, and Tiryns that were mentioned in Homer's epics and are thronged by tourists today (Moschos 2007:6; Davis et al. 1997). There is much that needs to be clarified for the periphery of the Mycenaean world to which Achaea belongs, including the fact that Achaea may not have been as marginal as it appears to be today. Scattered around Achaea's mountains and fertile coastal plain are over 100 Mycenaean sites including fortification walls, settlements, and cemeteries. Not every Mycenaean settlement was palatial and often the non-palatial settlements, like Kallithea, are forgotten archaeologically. Unfortunately, incomplete research and ambiguous conclusions regarding the Peloponnesus Mycenaean population is the result of this oversight.

Through the last few decades scholars have turned their attention to this region only to discover that it possesses more significance to the ancient world than previously realized. There is accumulating evidence suggesting that Achaea was a trade center for the Adriatic and Aegean, possessed a cohesive cultural and socio-economic base, and maintained traditions with neighboring Mycenaean throughout the Peloponnese including Attica, the Argolid, Boeotia, and Messenia (Mee and Cavanaugh 1990:238-41; Souyoudzoglou-Haywood 1999; Moschos 2007:7, 2009; Jung 2007; Molloy 2010). Moreover, the region is the original source of two unique pottery styles that have been found as far away as Cyprus. Achaea may have been one of the most significant areas of the Mycenaean civilization (Moschos 2007:7; Papadopoulos 1991:36).

Currently there are at least 75 known ancient cemeteries in Achaea. Among these sites there are some of the richest burials known in the Mycenaean world (Moschos 2007: 9, 14). Only four of the cemeteries have had any bioarchaeological investigation. The Voundeni cemetery is currently being analyzed by Ioanna Moutafi (personal communication) of the University of Sheffield for her doctoral dissertation research. The five primary burials of the Klaus cemetery have been osteologically assessed, but these findings have yet to be published and it is unclear how many of the 62 secondary burial individuals have been analyzed (Paschalidis & McGeorge 2006). The cemetery at Krini near Patras has been published with a heavy focus on a single “warrior tomb” (Papazoglou-Manioudaki 1994). At Kallithea Laganidia the human remains from the single tholos tomb were examined by archaeologist Peter M. Fischer in 1987 but remain unpublished. For this project only five of the 23 chamber tombs were analyzed, due to time constraints, and the minimal availability of the skeletal material during my study season.¹ As for the rest of the Mycenaean world, with the exception of the skeletal remains of Argos, Deiras, Dendra, the Athenian Agora, and Mycenae, almost no Mycenaean human remains have been studied (Charles 1963; Deshayes 1966; Immerwahr 1971; Astrom 1977; Smith 1988, 2009; Brown et al. 2000; Abigail et al. 2008; Smith & Liston 2010). Thus the data gathered from the Kallithea Laganidia’s chamber tombs is of great value to the bioarchaeological record of this region, and represents a significant portion of the total known skeletal remains.

¹ In summer 2011 I cleaned and sorted all of the remaining available skeletal material from Kallithea Laganidia and I am currently seeking funding to continue the analysis in 2012.

Bronze Age Chronology and Terminology

This project deals with a very specific time, place, and civilization. In order to understand the entirety of this research, the chronology and terminology should be put into context.

The Aegean Bronze Age (3100-1150 BCE) refers to a number of distinct cultural traditions located around the Aegean Sea including the Minoans based on the island of Crete, the Cycladic culture of the islands in the middle of the Aegean, and the Mycenaeans on mainland Greece (Shelmerdine 2008: 4-5; Pedley 2007:33). The Mycenaean culture of the mainland is further divided into chronological periods determined primarily by pottery styles, and dated by both internal evidence and connections to Egyptian chronology. These chronological periods are termed Early Helladic (EH), Middle Helladic (MH), and Late Helladic (LH), and have been further subdivided as the pottery sequences have been refined [Table 2.1]².

Table 2.1: Bronze Age Chronology of Mainland Greece ²

Chronology ¹	Pottery Period
3100-2000	EH Early Helladic (I, IIA, IIB, III)
2000-1600	MH Middle Helladic (I, II, III)
1600-1500	Late Helladic I
1500-1430	Late Helladic IIA
1430-1390	Late Helladic IIB
1390-1360	LH Late Helladic IIIA1
1360-1300	Late Helladic IIIA2
1300-1200	Late Helladic IIIB
1200-1150	Late Helladic IIIC
1150-1000	SM ³ Submycenaean/Dark Ages
1050	Protogeometric

¹ Durations are in years BCE

² Figures 1.1 and 1.2 from Shelmerdine 2008: 4-5

³SM refers to Submycenaean which is after the Bronze Age

² It is noteworthy to mention that the term “Helladic” refers to Bronze Age cultures of mainland Greece. Helladic is also used interchangeably with “Cycladic” when describing the Cyclades (Pedley 2007:37).

Although there is clear continuity through the EH, MH, and LH periods, there are distinct variations in architectural and ceramic styles as well as social organization. EH spans the largest portion of time and exhibits the most variation within a single period. Simple fortification and architecture, and plain or burnished ceramics with simple designs, certainly do not define but are characteristic of this time (Pedley 2007:430). In addition, EH settlements were widely spread out across mainland Greece (Wright 2008: 234).

In the Middle Helladic, settlements dramatically swell in numbers throughout the mainland indicating a growth in population. The Middle Helladic is a time of social cohesion among settlements and exchange of artistic and cultural ideas. In addition, these settlements trend toward nucleation rather than the dispersion seen in the Early Helladic (Wright 2008:234, 241).

Late Helladic is the period of palace construction and uniform social order across mainland Greece. The architecture and ceramic styles are the most elaborate during the Bronze Age and the social organization and cultural trends seem homogenous (Wright 2008, Cavanaugh 2008). Economic, social and military power were concentrated by the palace elites, who controlled large areas, likely absorbing formerly independent towns and villages.

Burial customs also vary among these time periods. This topic is more fully addressed in the following section. However, in order to fully grasp Mycenaean burial customs a general comprehension of terminology is required.

Pit, cist, and pithos(oi) style graves were popular for single individual inhumation during the Bronze Age. Pit graves are a simple hole dug in the ground and covered. A cist

grave it a shallow pit grave but with stone-lined walls covered by slabs of stone. Pithoi are large storage jars also used for burials. Multi-individual burials most often include tumulus(i), shaft, tholos(oi), and chamber tombs (Wright 2008; Cavanaugh 2008; Crowley 2008). A tumulus is a burial mound above ground level usually made of earth. Shaft graves are deep graves built or cut out of rock and tend to have clay or slab covering. Tholoi are circular tombs with domed chambers that are partially underground but capped by a domed roof covered with stone that rises above the ground. A chamber tomb is a subsurface rock-cut tomb. Both tholoi and chamber tombs have a dromos and stomion (door). A dromos is the entrance path to a tholos or chamber tomb (Wright 2008; Cavanaugh 2008; Crowley 2008).

The locations of tombs varied as well. Depending on the time period, Mycenaeans practiced both intramural and extramural burial. Intramural indicates that burials were placed under the floors of homes or within the settlement's boundaries. Extramural usually refers to an entire cemetery located outside of the settlement's boundaries (Caskey 1973:133; Howell 1973:75; Nordquist 2000).

Burial Customs

Understanding the progression of Mycenaean burials customs is very significant to the biocultural and social context of this research. The Mycenaeans and their graves are not a new scholarly topic. The archaeology (Tsountas 1897; Wace 1932; Blegen 1937; Persson 1931, 1942), tomb typology (Pelon 1976), and afterlife beliefs (Andronikos 1968; Mylonas 1951; Vermeule 1964, 1979) of the Mycenaeans have been and continue to be (Shelmerdine 2008; Dickinson 2006, Preziosi & Hitchcock 1999; Cullen 2001) thoroughly investigated.

Tomb Chronology

Even though there are varying styles of tombs throughout the Bronze Age, they all share similar purposes in construction and use. These variations were influenced by both cultural change and social status of the buried individual (Cavanaugh 2008:330). In addition, geographical location influenced the types of styles used. If the geology of an area is not conducive toward a particular type of tomb, then a more suitable design will be more prominent than the widespread trend at the time (Cavanaugh 2008:330). The “soft tertiary sediments” ideal for the construction of chamber tombs were not always available and a different tomb had to be used, often one that used masonry (2008:330). This is seen in LHIII Messenia where tholoi are constructed instead of the chamber tombs that were more common elsewhere in that period. (2008:330).

The Early Helladic is the period with the most simple Mycenaean tomb constructions. Single burials in pit, cist, tumuli, and shaft graves were most prevalent. In addition, it was more common to have intramural rather than extramural burials. The simplicity of burial style was reflective of the state of society. The Mycenaean culture was not yet a wealthy and powerful culture. Early Helladic was made up of small dispersed settlements resulting in minimal cohesion of cultural ideals and social structure (Wright 2008, Cavanaugh 2008, Mee and Cavanaugh 1984). The transition into MH marked significant change for mainland populations.

During MH, Mycenaean culture built elaborate burial structures including tumuli and the earliest tholoi that were associated with the community leaders (Wright 2008:243; Cavanaugh

2008:329). Toward the end of the Middle Helladic there was a higher frequency of multi-individual burials (Vermeule 1964:80-81; Dickinson 1977:59). Not only were multiple individuals being buried but also the tombs were being designed for reuse (Mee & Cavanagh 1984:48) and designated to specific families (Mylonas 1972-73: 389-90; Abigail et al. 2008; Brown et al. 2000). It should also be noted that pithos burials, although rare in Mycenaean Greece, are most prevalent during MH (Cavanaugh 2008:330).

Middle Helladic burial mounds and tumuli often contained additional individual burials within the main structures including pits. Regardless of the variation, this type of mass burial was meant to keep the individuals together in the afterlife. These tombs were visible markers on the landscape, and probably reflect the increasing centralization of power and wealth in the Middle Helladic. They are indicators that the leading lineages that controlled power and wealth in life also deserved such consideration in death.

The growing stability of the Mycenaean culture during MH is reflected by the permanency of settlements that lasted over several generations. By MHII, the burials in the tumuli and cemeteries noticeably began to include men and women of varying ages, but children were buried separately. This indicates that keeping lineages of adults, at least, together was a priority among Mycenaean settlements. Maintenance of lineage was also reflected in the widespread popularity of cemeteries, defined mound burials and the construction of grave markers. Though these trends are not uniform they certainly indicate a “social structure evolving toward a lineage-based society” which transitions into the Late Helladic (Wright 2008:238).

All of the Mycenaean tombs styles were present during the Late Helladic, but certain tombs were more fashionable than others. In general the tombs are less elaborate and have fewer rich grave offerings than the earlier MH tombs types (Mee & Cavanaugh 1984: 46-7, 49; Wace and Blegan 1930). Simple tumuli, pit, and cist graves are found in LH to the end of the period (Wace & Blegan 1930; Wright 2008:238). Late Helladic cist and shaft graves most often were intramural (Caskey 1973:133; Howell 1973:75, Nordquist 2000). However, extramural cemeteries were not uncommon (Mee & Cavanagh 1984:47). The Late Helladic was also characterized by the more frequent use of the tholos and chamber style tombs. By LHI the tholos was introduced on a widespread basis (Wright 2008:245). The tholoi especially were associated with high status individuals as indicated by the larger size and affluent grave goods (2008:245).

Prior to LH, children were more often buried separately from adults. Child burials were more likely to be within the settlement than extramurally among the adult burials. This pattern is found at several Mycenaean sites including Malthi, Lerna, Eleusis, and Mycenae (Dickinson 1977: 33; Mylonas 1932; Mee & Cavanagh 1984:46; Paschalidis & McGeorge 2006).

By LHIIA, tholoi were associated with well established communities, some of which consolidated, which further suggests that the tholos tomb style was used to house a leader or higher social status individual and associated family/peers (Wright 2008:245-46; Mee and Cavanaugh 1984:50). This is seen at sites with a single tholos tomb including Kallithea Laganidia, Analipsis, Marathon, and Vapheio (Mee & Cavanagh 1984:50). Also during this time there are sites with multiple tholoi including Mycenae, Pylos, and multiple towns throughout Messenia. These tombs are less likely to have belonged only to a single ruling

family, but were probably used by a number of noble or elite lineages based in the palace centers and wealthy towns (1984:50). This variation is a good example of how tomb trends could have been influenced by cultural change, social status, or geology.

Overall, during LHIIA-IIB the ruling elite were building elaborate tholoi and chamber tombs of large size. Interestingly, LHIIIA marks the beginning of chamber tombs being used across the social status spectrum. These chamber tombs possessed simpler design and lower quality grave goods as compared to the tholoi (Mee and Cavanaugh 1984). The variation in grave goods suggests that tholoi and chamber tombs were no longer exclusive to members of the ruling class (Mee & Cavanaugh 1984:59).

The variation of tomb use in both the chronology and among Mycenaean settlements could suggest that the tomb types are not invariably associated with particular social strata. Moreover, the varying social classes using the same tomb types further suggest that there is no definitive demarcation of social stratification based on elaboration of tomb or tomb type. This sort of ambiguity can be better defined by means of osteological analysis and interpretation, analysis of the spatial orientation of tombs within a cemetery, as well as assessing the quality of the burial goods.

Ancestor Veneration

Mycenaean multiple burial tombs often consist of both primary and secondary burials. Primary burials may be easier to understand both archaeologically and bioarchaeologically, but secondary burials seem to be associated with deliberate burial rituals as well. Chamber, tholoi, tumuli, and shaft graves are all designed to be reopened for continual use (Cavanaugh

2008:328). Having access to tombs, the individuals inside of them, as well as the grave goods contributes to the prominence of a lineage by connecting the deceased and living individuals of that community.

Mycenaean secondary burial rituals are not well understood and are probably much more elaborate than current archaeological interpretation suggests. However, having access to a family tomb allows individuals to incorporate the remains of the tomb in multiple rituals that include burning inside the tombs, taking out grave offerings, and adding new grave offerings. These rituals contributed toward the “rite of aggregation” when the deceased was released from an ambiguous post-burial state and allowed to join ancestors (Cavanaugh 2008:340).

The archaeological evidence of these ritual activities provides a better understanding about Mycenaean tomb variation and use. The family tombs provide a permanent location for ancestors and living relatives (Cavanaugh 2008:340). It is important to remember that open access tombs like chamber and tholos styles, were constructed to endure time to benefit both the living and the dead (Mee and Cavanaugh 1984:49). These tombs heavily contribute toward Mycenaean family identity and traditions that could last for generations.

The Social Stratification of Tombs

It was not until the work of Mee and Cavanaugh (1984) that the social and political implications of Mycenaean cemeteries were seriously addressed. As already mentioned, the social implication of tomb use varies throughout the Bronze Age. For this thesis it is now appropriate to focus on Late Helladic III tomb use and how it reflects social stratification

according to tomb structure differences, tomb content differences, and tomb spatial distribution variations.

Tomb Structures

Late Helladic IIIA is a period of large-scale dominance and centralized power marked by the construction of the palaces at Mycenae, Tiryns, Thebes, Pylos, Eleusis, and Midea³ (Wright 2008:249; Crowley 2008:261).

The prominence of pit and cist-style tombs during the LHIIIA dissipated as the popularity of the chamber style increased. During this period tholoi were also popular but spatially dispersed. By LHIII, chamber tombs were being used by the full spectrum of social classes and the tholos was still the tomb built for the socially elite (Mee & Cavanaugh 1984:55). Cavanaugh (2008:331) suggests that the popular use of chamber tombs among small Mycenaean communities could be a case of emulation, as chamber tombs often resemble miniature tholos tombs. In smaller, less wealthy communities, the families of lower social classes probably were imitating the style of the wealthy nearby large communities (2008:331) such as Mycenae, Tiryns, Thebes, Pylos, Eleusis, and Midea⁴ (Wright 2008:249; Crowley 2008:261). Even though the tholos seems more appropriate for an elite class, many scholars (Alden 1981:19; Bintliff 1977: 289; Taylor 1983: 81) believe the chamber tomb to be a privilege of the elite as well, indicating a high-status burial (Mee & Cavanaugh 1984:54) depending on where the tomb is located and quality of burial offerings. Thus, if a family's social status or wealth changed through the generations, the chamber tomb style could

³ The influence of the palace system lasted until its destruction during LHIIIB (Crowley 2008:281)

continue to be used by the family even though their fortunes had changed. Therefore, a tholos or chamber tomb could possess both elite and sub-elite individuals. This means that chamber tombs themselves are not an indicator of status as both the elite and common classes were using this tomb style in the Late Helladic (Mee & Cavanaugh 1984:50).

Tomb Contents

Late Helladic burial offerings reflect varying levels of status. The transition from MH to LH included a definitive transition toward communal recognition of a higher class of individuals. This transition is seen among mainland and nearby island⁵ communities and is reflective of the Mycenaeans having become wealthier, politically established, and socially cohesive. The inhumed elites possessed luxurious items that indicated power and prestige. Luxury items from neighboring Aegean cultures, elaborate armor, and various metal objects are just few of the common offerings found among tombs of high status individuals (Wright 2008:239). The reflection of social stratification by means of material items was at its peak at the end of the MH and transitioned into LH.

Spatial Distribution of Tombs

In addition to construction and contents, a third marker of status in burials may be the spatial location. In particular, proximity to a high status tholos tomb may have given

⁵ Including Boetia, Attica, the northeast Peloponnese, Messenia, and on the islands of Keo, Lefkas, and Aegina (Wright 2008:238-239).

additional importance to the tomb of a less powerful family. As already mentioned, the tholoi contained the community leaders and their families and in the smaller peripheral communities there may be only a single tholos. A chamber tomb filled with high quality burial offerings would suggest high social class, but once the funeral was over and the tomb closed the social significance of the tomb's wealth was known only to the associated family and others who have access. To show power and elite status among the living community, it would be socially significant to have the family tomb positioned physically closer to other tombs with similar social standing and to the tholos itself. By doing so, the status of the living family lineage could be reinforced and maintained for future generations.

Social Stratification at Kallithea Laganidia

In light of the evidence for social stratification in burial practices at other Mycenaean cemeteries, this thesis will address the question as to whether or not there is social stratification at Kallithea Laganidia, and whether or not this is reflected in the physical condition and health of the people buried in the tombs. According to the cemetery's excavator, the archaeological material reflects social stratification. Tombs closer to the central tholos possess a richer quality of grave offerings than those at a distance (E. Papadopoulou-Chrysiopolou, personal communication).

Kallithea Laganidia cemetery includes a single tholos and 23 chamber tombs. The tholos is the central focus of the cemetery's organization and this influenced the chamber tombs' positions [Figure 1.3]. Unlike the chamber tombs, the tholos tomb required sophisticated construction materials and skills. The interior walls of the tholos chamber were

lined with masonry present nowhere else in the cemetery and the interior tholos chamber is noticeably larger than the chamber tombs [Figures 2.1 & 2.2]. These qualities are believed to reflect social significance of the individuals buried within tholos-style tombs (Mee & Cavanagh 1984:47). Moreover the archaeological findings suggest that the estimated 40 individuals of the tholos were elite individuals (Fischer 1987; Papadopoulos 1991:36). Even though the tholos was found to be robbed during ancient times, still the remaining burial offerings were significant (Papadopoulos 1991: 36).

Several vessels of varying types, sizes, and quality, a bronze knife and pin, pieces of iron, ivory plaques, sea shells, and steatite buttons were among the seven soil layers of the tomb which was used from LHIII to the Protometric period [Table 2.1] (Moschos 2007:25; Papadopoulos 1991: 36) (E. Papadopoulou-Chrysikopolou, personal communication). In addition, copious amounts of faunal remains were recovered including bones of pig, equine, canine, and bos⁶ (Fischer 1987:10-11; Papadopoulos 1991:36). Of these, archaeologically the dog and horse possess the most significance, both of which, along with a primary burial of an adult male, were the earliest material in the tholos (Fischer 1987: 10-11; Papadopoulos 1991: 36). Since these are items that reflect high status, they also set the social standard for not only deserving a tholos but also being the central focus of an entire cemetery.

The horse remains are referred to as a “horse sacrifice” by Papadopoulou (1991:36). Bronze Age horse burials are rare but when present denote high social status (Marinatos 1970; Mee & Cavanagh 1984:47-48; Mee and Cavanaugh 1990: 226; Catling 1979:14). Equine

⁶ It should be noted that the final osteological analysis report completed by Peter Fischer in 1987 has yet to be published and, until this thesis, has only been seen by the excavators. Moreover, the faunal remains have never been formally analyzed or published. What is known about the faunal remains was provided by Fischer who acknowledges his lack of zooarchaeological expertise.



Figure 2.1: Kallithea Laganidia tholos tomb showing collapsed roof, masonry, dromos, and chamber



Figure 2.2: Kallithea Laganidia tholos tomb's chamber

remains have been found at other locations including Marathon in Attica, and in southwest Peloponnese tombs like at Midea, and Argos (1970; 1984:47-48; 1990:226; 1979:14).

It is assumed by the excavators that the tholos was built initially for a high status burial, presumably a male, and the additional individuals shared an elite lineage or association. Whether this association was familial, political, or social cannot be determined. However, those who were buried in the tholos possessed the most social significance within the cemetery as indicated by the construction of the tomb, the tomb contents, and the spatial orientation of the tomb among the smaller chamber tombs.

The chamber tombs share similar shapes, sizes, and construction. All of which are much more modest than the tholos. The chamber tombs possess burial offerings and, depending on the distance of the chamber tomb from the tholos, the quality of the burial offerings varies. The excavators have demonstrated that the quality of burial offerings diminishes the farther away a chamber tomb is positioned from the tholos. Tomb XIII was robbed in antiquity and is the only chamber tomb that did not yield burial goods. The tholos was also robbed in antiquity, but still yielded a valuable collection of Achaean archaeological material. Faunal remains have not been reported among any of the chamber tombs and there is only one chamber tomb that contains burial offerings of similar quality to those in the tholos.

Tomb VIII, the “warrior tomb” is one of the wealthiest tombs of its kind in the Achaean area (Papadopoulou 1991:36; Moschos 2007:25). The burial offerings are very high quality and include a bronze sword, double axe, and jewelry. The term “warrior tomb” is an assumption made by the excavator that the individual was a warrior in life due to the militaristic quality of the associated artifacts. There are several examples of similar grave

assemblages throughout the mainland and Bronze Age (Papazoglou-Manioudaki 1994; Smith and Liston 2010; Smith 1988, 2009).

However, through osteological analysis of “warrior tombs” it appears that these individuals are high status individuals rather than battle experienced warriors. More than not, “warriors” exhibit no skeletal evidence of warlike injuries (Smith & Liston 2010; Smith 2009; Smith 1988). Also it should be noted that Tomb VIII is one of the most recent burials of the Kallithea Cemetery and could belong to a new generation of Kallitheans that celebrated this “warrior”. In addition, Tomb VIII is positioned very close to the tholos which suggests that, however this individual was regarded during life, a “warrior” still needed to be positioned close to the tholos. Unfortunately, the osteological remains from tomb VIII were not available for assessment during my data collection.

The analysis of the tombs at Kallithea Laganidia indicates that there is social stratification among the burials. The types of tombs, archaeological material, and spatial orientation of the tholos and chamber tombs reflect a structured hierarchy that the living Kallithea community took care to express in the cemetery as well. Given that the social differentiation appears to be an important aspect of the society, I expect that these differences will also have an impact on the lives and health of the individuals and be reflected in the osteological evidence.

I propose that tombs located closer to the tholos will contain burials with less evidence of stress than those located further away from the tholos. There are a number of reasons for this. For instance at Mycenae, the socially elite had better diets consisting of more proteins than grains and this can impact health on an individual and population basis (Vermeule 1983;

Halstead 1995, Halstead and Isaakidou 2004; Isaakidou et al. 2002; Valamoti 2004; Petroutsas & Manolis 2010; Petroutsas et al. 2004, 2009). Moreover, socially elite individuals tend to not exhibit signs of hard labor skeletally. For example, an individual of lower class would be more likely to incur battle injuries, since previous studies have shown that the socially elite may rarely have participated in those sorts of activities (Smith 2009, 1988; Smith and Liston 2010). Occupationally the non-elite would be completing the labor intensive tasks of the community such as farming or herding. Knowing these factors, I expect to see poorer dental health, more enthesopathies, and fractures of the long bones and crania among the individuals of the tombs located farther away from the tholos tomb at Kallithea.

CHAPTER 3: MATERIALS

The Kallithea Laganidia Cemetery and Burials

Kallithea Laganidia was accidentally found in 1986. From 1986 to 1988 the tholos tomb and chamber tombs I-IV were excavated as a rescue project. The excavation began again in 1998 and was completed in 2002. During this time tombs V-XXIII were found and fully excavated. Thanasis J. Papadopoulos directed excavation for the project's entirety, and the excavation functioned as an archaeological field school for all eight years.

The site of Kallithea Laganidia overlooks the gulf of Patras and is about twenty kilometers south of Patras' city center. The cemetery consists of twenty-three chamber tombs arrayed around a single centrally located tholos tomb. The site's excavator proposes that the location of the tholos suggests that the inhumed individuals were of high status and possibly family members of a community leader (Papadopoulos 1991:36). All date to the latter part of the late Bronze Age, with a range of Late Helladic IIIA to Late Helladic IIIC (1390-1150 BCE).

The tombs are situated on a hill sloping downward toward the sea in a West-Northwest direction. Based on the plan view drawing available [Figure 1.3] the tombs appear to be discrete, not overlapping or running into one another. This suggests that the cemetery either was preplanned or that knowledge of earlier tombs' locations was passed down from generation to generation. Either of these scenarios also suggests that the cemetery's population contained members belonging to nearby communities (Mee and Cavanaugh 1984, 1990).

The soil type within the cemetery is called kimilia, a very hard, white, asbestolithic soil that is quite difficult to excavate. The chamber tombs' diameters ranged from 0.73m to 2.83m. The roofs of all of the chamber tombs were collapsed. The tombs were excavated from above, beginning with the collapsed roof and down to the original floor surface. For all twenty-three, the dromoi, which ranged from 2.0m to 6.6m in length, were excavated simultaneously with the excavation of the main burial chambers. The tombs represented on the excavation's plan view map appear to have a similar shape and construction. The chamber tombs dromoi follow the hill's west-northwest slope with the chamber entrances on the west. The chamber tomb depths range from 0.20m to 2.10m (E. Papadopoulou-Chrysiopolou, personal communication). Much of the cemetery was close to the ground surface due to years of erosion following agricultural activity using heavy machinery for clearing. This is how the cemetery was found. This activity may also have contributed to the collapse of the tomb roofs.

The tholos tomb is distinctively different from the chamber tombs within the cemetery. The chamber is 3.90m by 4.10m and 2.26m deep (E. Papadopoulou-Chrysiopolou, personal communication). It has a larger burial area lined with masonry, the entrance is on the south-southwest side, and the dromos, which is 7.10 m long, is oriented south-southwest to north-northeast. The tholos' orientation is nearly perpendicular to the twenty three chamber tombs. The construction styles of both the tholos and chamber tombs are similar to other Mycenaean cemeteries of Achaia (Papadopoulos 1991).

Human remains were recovered from all tombs except for X and XII. The other twenty-one tombs contained primary and/or secondary burials. Using the excavation photographs, it was possible to determine that the primary burials were consistently in place on their backs with the legs flexed at both the hips and knees. The knees rested either to the

right or left, with no indication of patterning. The arms were either flexed with hands resting on the anterior thorax or in extension resting at either side of the individual [Figure 3.1]. The secondary burials consistently possessed no organization and showed no evidence of patterns of selection of particular bones (i.e. crania). They were pushed aside and piled up against the chamber walls leaving just enough space for the new primary burials. The archaeological material varied among tombs and included ceramic vessels of varying quality, bronze objects, beads, and beaded jewelry [Appendix B]. The primary burials had artifacts placed near the individuals, often in proximity to the cranium or thorax. The artifacts mixed among the secondary burials were treated in the same manner as the human remains.



Figure 3.1: Example of Kallithea Laganidia Primary Burial Style, Tomb XV, Burials A, M, and N

In 1987, at the behest of the excavator, Dr. Peter Fischer analyzed the human remains from the tholos tomb. He stated that there were forty individuals present in the tomb

(Papadopoulos 1991:36), but based on his osteological report, there appear to be only approximately thirty individuals represented. The reason for this discrepancy is not clear. Fischer sexed ten individuals as male, eight female, seven indeterminate, and at least five were not evaluated. (1987:36). Age estimations ranged from 1.5 to 48-52 years old. At least two juveniles and two subadults were among the individuals assessed. Fischer also makes mention of the high number of faunal remains including bones and teeth of pig, canine, bos, and equus (Fischer 1987:10-11). “A complete [faunal] report [was] forthcoming” but is currently not known to exist (1987:5). Papadopoulos mentions that there are “the remains of a horse sacrifice in the lowest level of the tholos, which is a very rare burial habit in the Aegean” (Papadopoulos 1991:36) but is not unheard of (Marinatos 1970; Mee & Cavanaugh 1984; Catling 1979). Fischer makes no mention of a substantial amount of equine remains or sacrifice.

In 2002, following a brief visit to the excavations, Dr. Sherry Fox, director of the Wiener Laboratory at the American School of Classical Studies in Athens (ASCSA) agreed to arrange for the study of the Kallithea Laganidia burials. The lab acquired seventeen boxes of human remains from the Kallithea Laganidia cemetery. These boxes represented Laganidia tombs XV, XVI, XVI, XVIII, XIX, XX, XXI, XXII, and XXIII.

Prior to this, the material was stored in a storeroom in Patras, the site of the regional headquarters of the Greek Archaeological Service. In August of 2011 another two boxes were transferred to the Wiener Laboratory, containing bones from tombs VIII-IX and XIV. These materials were thought to be lost when I began my study, and were discovered after I completed the initial assessment of the skeletal remains. Many of the remains were not found

and/or delivered to the Wiener Laboratory after I returned to Canada. For my study in 2011, only a small percentage of the cemetery's osteological material was available for analysis.

The material was organized by tomb in cardboard boxes of various sizes. Within the boxes the human remains were organized and packed according to the soil layer, date excavated, and then by burial context. Primary burials tended to be packaged by section of the body (upper limbs, lower limbs, cranium, thorax, and pelvis). Crania from primary and secondary burials were packaged separately and were individually distinguished by Greek alpha-numeric designations during the excavation in the order they were uncovered (K PANIO A, B, Γ, etc.). Each box of the human remains was packaged, labeled, and sealed in the field.

Besides Fischer's work in 1987, very little analysis had been done prior to my study. Dr. Sherry Fox examined and x-rayed the cranium of primary burial Α from Tomb XV at the request of the excavator. In addition, Wiener Laboratory volunteers had washed a small portion of the osteological material from Tombs XVI and XXI. No other osteological analysis of the Kallithea Laganidia material took place until 2011.

The excavators were very forthcoming with any and all documentation of the cemetery. Each tomb's archaeological and bioarchaeological material was organized and given to me while in Athens and after I completed my research. , I am still able to provide a preliminary minimum number of individuals (MNI) for the entire cemetery even with limited access to the material. Using excavation documentation and photographs, the cemetery's MNI, including the tholos tomb, is 100.

For this thesis, only five tombs were fully analyzed: XV, XVI, XVIII, XIX, and XX. These tombs contained at least 35 individuals in 18 primary burials, and 17 secondary burials. Due to the fragmented and commingled nature of the remains, the MNI was based on cranial elements for most of the tombs. Male and female adults, juveniles, subadults, and neonatal individuals represented this sample. It should also be noted that the primary burials were only of adult individuals.

CHAPTER 4: METHODS

Due to the limited amount of time available for my study in 2011, and because not all of the remains had been found in the storerooms when I began my work, it was necessary to select a subsample of the cemetery for this project.

Five tombs, numbers XV, XVI, XVIII, XIX, and XX were selected from the nine available at the Wiener Laboratory for specific reasons. First, tombs close to and far away from the tholos were selected in order to test if social stratification is reflected in a chamber tomb's location. Second, Tombs XXII and XXIII were ineligible for this project's analysis due to the high probability that additional material belonging to these tombs was still in Patras. Tomb XXII is represented by three boxes labeled "3", "4", and "5". Potentially boxes "1" and "2" are still in storage. Tomb XXIII is in the same situation, except only one box is at the Wiener Laboratory labeled "8". If my assumption is correct then XXIII potentially could have seven additional boxes of human remains. Third, during tomb selection the available site map contained only tombs I-XVIII and the tholos; without the exact location of the tombs, it was impossible to use them to test the hypothesis that spatial location is related to status of the burials. However two tombs with unknown locations, XIX and XX, were included because the complete contents were available [Figure 1.3].

I analyzed the human remains from each tomb in the order in which they were excavated and then by contextual soil layer. This approach enabled me to examine the material in the same order that was seen and interpreted by the excavator. Moreover, this method allowed me to compare photographs, ceramics, soil layers, and orientation of the human remains. This is particularly significant because human bone loses its structural integrity once taken out of the archaeological context (Buikstra & Ubelaker 1994;

Benhrensmeier 1978). For the Kallithea Laganidia material, often a photo of a burial shows more identifiable bone than what remains packaged by the excavators [Figures 4.1, 4.2]. This is the nature of excavating human remains and why it is imperative to possess all of the contextual documentation at the time of osteological analysis.

The packages of bone from every tomb were unpacked and photographed prior to cleaning the bone. Each individual package was assigned a box number that corresponded with the original packaging of the material by the excavators. Then each individual package received a bag number that belonged to a specific box. For example, Tomb XV was represented by two boxes, 1 and 2; within box 1 there were 30 packages. The general contents of each package were documented and each package received a bag number. This method enabled the general contents of each box to be known and easily referenced. The purpose of this method of organization was to maintain the packing strategy completed in the field during the excavation. In case archaeological documentation made mention of the box number assigned in the field, this information would not be lost during the osteological analysis. The bag numbers were solely for this project's organization and are not contextually significant for the material.

Each tomb's osteological material was cleaned by both dry or wet brushing using tooth brushes and wooden tools. Each bag of bone was kept separate during the washing phase to avoid contamination of excavation, collection, and sampling of the material. The bones dried outside in the shade on drying racks. When possible, soil samples were taken prior to wet brushing, normally from the interior of cranial cavities and long bone shafts.



Figure 4.1: Showing amount of human bone present while in situ, Tomb XVIII, Burial A



Figure 4.2: Showing amount of human bone recovered post excavation, Tomb XVIII, Burial A Cranial Fragments

If soil was available, samples were collected from each soil layer, primary burial, cranium, and acetabulum within each tomb.

While washing the bones it became clear that the osteological analysis would be heavily dependent on cranial reconstruction given the degree of preservation and fragmentation of the post crania. The crania were reconstructed in order to best evaluate and photograph skull morphology, pathology, and non-metric traits. For each burial, I reconstructed both crania and post cranial elements, using standard methods. This included the use of a PVA glue and temporary stabilization using masking tape. For the tombs analyzed, unless the cranial sutures were fused, cranial bones were reconstructed individually (frontal, temporals, parietals, occipital, and basilar) and no unfused sutures were glued. Cranial measurements were not taken, as complete cranial reconstruction was not a part of this project's methodology due to time constraints.

The primary burials received the most attention for reconstruction. Long bones and the crania were reconstructed to the fullest extent for analysis and radiographs. The preservation among the tombs varied. In order to reach an accurate MNI for each tomb, reconstruction was used to confirm that the identified primary burials. In some cases more individuals were present than recognized by the excavators. This occurred both among primary and secondary burials in Tombs XV, XVI, and XIX. During the washing process I also recognized that there was at least a single subadult cranium not identified during excavation in Tomb XXI. Additional individuals were identified often by single elements such as occipitals, left and right temporal, petrous portions, tali, and mandibles.

The crania from the secondary and commingled remains were reconstructed to the necessary extent to assess cranial morphology and epigenetic variation. The post crania were reconstructed to best determine the MNI. This mostly entailed long bone reconstruction. The number of crania among the secondary burials established the MNI consistently among the tombs analyzed.

Bioarchaeological projects in Greece tend to follow both accepted standards of osteological analysis, most commonly using the European Anthropological Association's standards and those in the *Standards for Data Collection from Human Skeletal Remains* by Buikstra and Ubelaker (1994) (Eliopoulos et al. 2011:180). The methods organized in the *Standards Manual* are regarded as the most useful due to the repeatability of the methods selected (Eliopoulos et al. 2011:180).

Determining Sex and Age

Basic demographic data are necessary for understanding a cemetery's biocultural context. Age is an indicator for health status, pathology, and age related skeletal deterioration such as osteoporosis or arthritis. Sex determination better enables burial patterns to be discerned as well as interpreting skeletal markers associated with gender specific occupations.

Methods of Determining Age in Adults

For the five tombs analyzed, data were collected based on the standards set by Buikstra and Ubelaker (1994). Age was determined using morphological evaluation of the indicators of the os coxae, such as the pubic symphysis (Todd 1921a-b; Bass 1987), auricular

surface, (Lovejoy et al 1985; Meindl and Lovejoy 1989; Bedford et al. 1989; Bass 1987), cranial sutural closure (Buikstra and Ubelaker 1994; Meindl and Lovejoy 1985; Holk 1998), and degree of dental attrition. For adults the cranial suture closure and dentition proved to be most useful methods for assessment. As mentioned prior, there were only two complete auricular surfaces among the five tombs and these were aged using the methods of Buikstra and Ubelaker (1994) and Lovejoy and colleagues (1985).

Holk's work discusses the aging of cranial sutures among cremated human remains. He scores the morphology of the endocranial and ectocranial sutures together. Given the fragmented nature of the Kallithea material, the cranial sutures are able to be assessed using all three of the methods mentioned above. Where possible, I examined the left side sutures at the seventeen suture points outlined by Buikstra and Ubelaker (1994) (Mann et al. 1987; Meindel and Lovejoy 1985; Todd and Lyon 1924, 1925a-c). If these points were damaged then the right side was evaluated.

Methods of Determining Sex in Adults

The individuals of Tombs XV, XVI, XVIII, XIX, and XX were sexed by whatever means were available, based on the preservation of the crania and ossa coxae. The generally well preserved fragmented crania were most consistently available among the tombs. The nuchal crest, mastoid processes, supraorbital margin, glabella, and mental eminence were used first for sexing for the crania in both primary and secondary burials. These elements were scored on a five point scale: (1) female, (2) probable female, (3) indeterminate, (4) probable male, and (5) male (Buikstra and Ubelaker 1994).

For primary burials, the multiple visual indicators of the os coxae then were assessed and compared to the crania sexing (Phenice 1969; Bass 1987). However, due to the commingled and fragmented nature of the secondary burials, the crania were the most useful indicators of sex throughout the five tomb sample.

Methods of Determining Age and Sex in Subadults

Non-adults were aged and sexed using the methods outlined by Buikstra and Ubelaker (1994), Scheuer and Black (2000), and Schaefer and colleagues (2009). Only within Tomb XV was there potentially a nearly complete subadult skeleton. When subadult bones were identified they were aged, and sexed when possible, individually. Cranial fragments were the most common evidence of subadults and fetal individuals. Basilar, petrous process, and occipital fragments were the most frequent. Identification and aging of subadults heavily depended on deciduous dentition and radiographs of mandibles [Figure 4.3].

Issue of Stature Assessment

Even though long bone diaphyses were present among the tombs' primary and secondary burials they were not measured for this project. No long bones of any age or sex were consistently measured because none were complete enough to provide conclusive data and due to time constraints. Nearly 100% of the long bones were without distal or proximal epiphyses or too fragmented for reconstruction. Even the long bones that were reconstructed to the greatest degree, especially those of primary burials, would only have provided "at least" estimations for age and stature (Trotter and Gleser 1952).



Figure 4.3: Subadult aging using the mandible, Tomb XV, Burial H

Paleopathology Assessment

Even though this project examines only 38 individuals of the entire cemetery, it is significant to assess the presence or absence of gross indications of pathology.

All of the skeletal material was examined for pathological conditions including infection, trauma, dietary and metabolic disease, and developmental defects. All of these general conditions can cause the formation of periosteal bone. Periosteal reaction, the generation of new bone as a result of stress caused by physical exertion or infection, was closely inspected (Ortner 2003: 88). Myriad diseases cause periosteal reaction, thus, if present, depending on skeletal location and severity, a differential diagnosis was required.

Moreover, antemortem and perimortem periosteal reaction was evaluated in several forms such as a nearly healed fracture or a maxillary alveolus abscess.

More specifically, the common pathologies among Bronze Age populations were especially taken into consideration. These included but are not limited to cribra orbitalia, brucellosis, fungal infections, and bacterial meningitis. In addition to the expected pathologies, there were benign cases such as hyperostosis frontalis interna, cranial osteomas, and mandibular abnormalities. These pathologies will be fully addressed in the following chapter.

Most importantly the dental attrition was assessed as poor dental health can lead to cardiovascular complications that leave no skeletal evidence but can be assessed. Periodontal disease increases the risk of coronary heart disease due to the potency of the oral bacteria entering the blood stream lethal (Ortner 2003: 593-4). This is a lethal medical complication in modern populations and was prevalent among ancient populations as well. Dental health pathology is discussed in the following section.

Dental Health

The preserved teeth were inventoried and evaluated for the presence of calculus, degree of attrition, caries, antemortem tooth loss, enamel hypoplasia, postmortem damage, abscesses, and periosteal activity. These characteristics were evaluated using the inventory standards on all *in situ* maxillary and mandibular dentition of both primary and secondary burials (Buikstra and Ubelaker 1994). Due to the varying degree of antemortem tooth loss and attrition among the tombs, two aging methodologies were used. Often molars were lost ante

mortem as indicated by the deterioration of the alveolar bone, but the anterior teeth remained in the jaws and for these Smith's (1984) scoring method was used. For molars that did not succumb to antemortem tooth loss, Scott's (1979) method was appropriate. In addition, Brothwell (1981) provides scoring for caries, calculus, as well as attrition. The dental health among the tombs greatly varies and these three scoring methods best suit the sample analyzed from Kallithea Laganidia.

Fischer's 1987 report of the tholos tomb assessed the dentition according to the standards of the Federation Dentaire Internationale (FDI) (1987:3). For the sake of consistency his methods and coding of dental health were considered and incorporated into this project's evaluation.

Heredity

The question of genetic relatedness is common when discussing Mycenaean burial practices (Wright 2008; Schelmerdine 2008; Mee and Cavanaugh 1984; Papadopoulou 1991). DNA sampling was not considered while excavating the cemetery, thus exposing the ancient remains to several modern individuals' DNA. Due to this, there were no precautions taken during the 2011 analysis at the Wiener Laboratory. Even though it is a destructive sampling technique, there are several teeth from which the uncontaminated dentin could be extracted and possibly yield usable aDNA in a future study.

For this project, cranial non-metric traits were assessed to evaluate possible hereditary trends among the individuals of the five tombs. The traits observed were scored by using Buikstra and Ubelaker (1994) and Hauser and De Stefano (1989). Parietal foramen, metopic

sutures, sutural ossicles along the sagittal and lambdoidal sutures, and Inca bones were recorded.

CHAPTER 5: PATHOLOGIES OF THE BRONZE AGE AND KALLITHEA LAGANIDIA

This chapter provides the paleopathological background necessary to understand the health of the Kallithea Laganidia cemetery sample. The presence high numbers of skeletal pathologies among a population may be an indication of poor health. But the osteological paradox suggests that skeletons without pathologies may not be an indicator of good health. However, the presence of pathologies is at least evidence for the type of diseases and trauma risks that the population suffered. The following sections include specific pathologies present among the 38 individuals examined. The results discussing these pathologies are discussed in the following chapter.

Cribræ Orbitalia and Porotic Hyperostosis

Porotic hyperostosis (PH) affects the outer table of the cranial vault bones, especially toward the posterior of the parietals around the fontanelles and lambda. This often leads to a thickening of the cranial bone and a reshaping of the parietals. Cribræ orbitalia (CO) is a localized form of PH and creates lesions that thicken the roof of the superior eye orbit. Both cases, often associated with anemia, are found worldwide among archaeological populations (Larson 1997:30). The difficulty with CO and PH is that several pathologies, including scurvy and rickets, create the porous and hypertrophic lesions found on the supraorbital shelf and ectocranial surface. Due to this, one should not consider anemia as the definitive cause of “porous, periosteal bone formation in these areas” (Ornter 2003: 370-1).

Not until 1966, when Angel introduced the term, was porotic hyperostosis the accepted name for this condition. Prior to this it was common to see spongy hyperostosis or cribra crania used to describe the pathology (Ortner 2003:371; Angel 1966).

Cribra orbitalia and porotic hyperostosis can be caused by environmental influence and genetic diseases. “Thalassemia, sickle cell anemia, nonspherocytic hemolytic anemia, spherocytosis and rarely, hereditary elliptocytosis” can cause skeleton-affecting iron deficiencies (Larsen 1997:30). Iron deficiencies also are known to amplify the risk of serious infection (Ortner 2003:370; Pasvol & Abdalla 1999:1552). Moreover, vitamin deficiencies like too little folic acid and B-12 can cause anemia. These vitamin deficiencies can be further escalated by intestinal parasites. Parasitic infections can vary but most commonly cause dehydration and block the proper absorption of necessary nutrients (Ortner 2003:370; Walker 2009). Angel thought genetic diseases were more often the cause of porotic hyperostosis and cribra orbitalia among Greek populations, especially thalassemia (1964a, 1966, 1967, 1971, 1978, 1984; Larsen 1997:33).

Thalassemia is a genetic disease that is seen among populations where malaria is prevalent. Individuals who inherit two genes for thalassemia almost always die in childhood, those who inherit only one copy of the gene are resistant to malaria, and die from it less often than individuals who do not carry the gene for thalassemia. Therefore there is an advantage to the heterozygotes, and the differential selection ensures that this gene for a fatal pathology is maintained at high levels in a population. This type of anemia is particularly significant to this project due to the modern presence of the disease in Greece. Angel suggests that most of his ancient Greek cases of PH are caused by thalassemia (Angel 1964a, 1966; Ortner

2003:372). Populations that live in environments conducive to mosquito breeding tend to have this hematopoietic disease (Ortner 2003:370).

Trauma and Biomechanical Stress

Evidence of trauma among ancient populations varies. Although trauma is technically defined as any injury to the tissues induced by external forces, including such things as heat and cold, most cases of identifiable skeletal trauma are the results of physical force. Trauma can result from acute events both from accidents and interpersonal violence, or it can be the result of chronic stress associated with work or daily activity. In most populations, high status individuals will show lower rates of trauma unless associated with elite activities such as warfare. Distinguishing between accidental trauma and deliberate trauma associated with warfare or interpersonal violence can be difficult but the locations and types of trauma can be instructive (Aufderheide & Rodriguez-Martin 1998:19-20).

Mycenaeans, like most people living in the preindustrial world, performed considerable amounts of physical labor in order to accomplish tasks of daily living. This can be documented through the identification of enthesopathies (Jozsa et al. 2004).

Enthesopathies occur at the site (enthesis) of insertion for tendons and muscles resulting in an alteration to the bone surface. Repetition of stress created enthesopathies and often suggests occupational or cultural activities (Jozsa et al. 2004: 43).

Angel has found Poirer's facets, a type of enthesopathy located on the superolateral third of the femur, among ancient Greeks (1964b, 1965). This type of bone-changing stress is caused by habitual hip extension and stabilization with an upright posture necessary to

maintain balance (Capasso et al. 1998:119). To do this, the gluteus maximus muscles must be extended for stability (1998:119). These are found among modern athletes including “football players, skiers, and horseback riders” (1998:119). Due to the physical strain necessary to create these enthesopathies in an ancient population, horseback riding or constant traversing of mountainous terrain would be probable causes (Angel 1964b, 1965). Something else to consider is that modern fur traders that carry heavy loads while jogging up and down trails also have these femoral enthesopathies (Capasso et al. 1998:119).

In addition, the Mycenaeans were considered a warlike civilization as evidenced by heavy fortifications, established palaces, images of warriors and warfare, and the presence of weapons and armor in graves (Vermeule 1972; Smith 2009; Dickinson 1994). There is written evidence that their Egyptian and Hittite neighbors felt they were a worthy adversary (Iezzi 2009: 175; Smith 2009:99). This was reflected in a mortuary practice, called “warrior” tombs by modern archaeologists, which has been found throughout the Mycenaean world including Athens, Pylos, Mycenae, and Kallithea Laganidia. The archaeological material found within these tombs suggested that the associated individuals possessed military honor or glory during life. Elaborate swords, knives, additional metal offerings, and higher quality ceramics reinforced the assumption that these “warrior” tombs contained individuals who had experienced or died due to battle trauma. On further investigation it turns out that “warrior” tombs were more often a status symbol rather than the tomb of a soldier exhibiting battle-related ante- or perimortem trauma (Smith 1998, 2009; Smith & Liston 2010). Kallithea Laganidia has one “warrior” tomb, Tomb VIII (Papadopoulos 1999). Unfortunately this tomb’s material was not available for analysis for this project.

Infectious disease

The endocranial infection found among this sample is characterized by several factors including the thickening of the cortical bone [Figure 5.1], sclerotic-shiny surface [Figure 5.2], and/or severe thickening of the frontal bone's diploe [Figure 5.3]. The endocranial surface is very smooth and has a resurfaced-ivory appearance. Also, the topography of the endocranium is more dramatically uneven than endocrania without these infectious characteristics. The dramatic uneven topography is most often in the inferior portions of the parietals and becomes more severe anteriorly into the endocranial surface of the frontal. Porosity or lytic areas are absent.

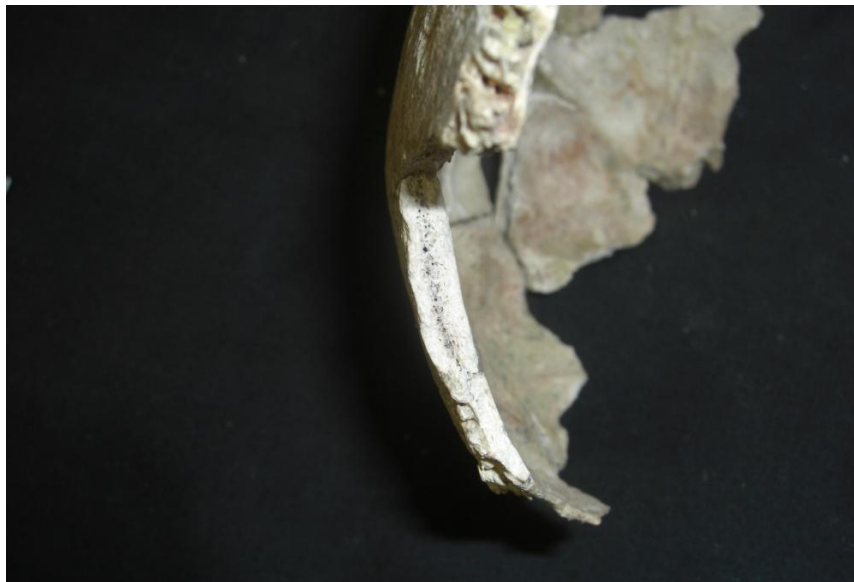


Figure 5.1: Endocranial Infection, cortical bone thickening of cranial bone, Tomb XVI, Burial I, frontal bone



Figure 5.2: Endocranial Infection: sclerotic-shiny resurfacing, Tomb XVI Burial Στ, left parietal



Figure 5.3: Endocranial Infection, diploe expansion of cranial bone, Tomb XV, Burial K, frontal bone

Brucellosis

Brucellosis is an ancient and modern infectious disease that is very prevalent in the Mediterranean (Young 2005:283; Auferheide & Rodriguez-Martin 1998:192). Consumption

of or contact with infected animal meat or unpasteurized dairy products are the most common means of contraction. Most often men who tend animals like goats, pigs, and horses suffer from this disease as it is considered an “occupational or professional disease” (Young, 2005:238; Auferheide & Rodriguez-Martin 1998:192; D’Anastasio, R. et al. 2011:155).

Vertebral bodies are most often affected by brucellosis. Characteristically brucellosis causes lytic areas, “osteoscleritic reaction and hypertrophic new bone formation” (Auferheide & Rodriguez-Martin 1998:192). Brucellosis of the spine can look similar to vertebral tuberculosis but without the vertebral collapse. Moreover, brucellosis is a disease that destroys and rebuilds bone simultaneously while tuberculosis is mostly destructive (Auferheide & Rodriguez-Martin 1998:193; D’Anastasio, R. et al. 2011:149). Brucellosis can also attack long bones causing rapid bone thickening and abscesses similar looking to osteomyelitis, which a bacterial infection of the bone (Ornter 2003:181). The hip is the joint most commonly affected by brucellosis (Auferheide & Rodriguez-Martin 1998:193). In addition to the skeleton, brucellosis causes gastrointestinal, genitourinary, pulmonary, hepatobiliary (liver), neurological, and cardiovascular complications (Young 2005:285-6). For some it can be a chronic illness (2005:286).

Meningitis and Otitis Media

Infection of the meninges or meningitis is most often caused by infectious material within the blood stream. Due to the meninges wrapping the brain, meningitis is a problematic and dangerous type of infection. Several invasive infections can cause meningitis including otitis media.

Otitis media is the infection of the inner ear which is most often found in young children (Rudberg 1954; Auferheide & Rodriguez-Martin 1998:253). Inflammation of the pharynx causes swelling within the ear which creates a stagnant pool of fluid that is perfect for bacterial growth. Eventually the fluid has to escape and this is seen on the superiolateral surface of the petrous portion of the endocranial temporal bone. The bacteria eat away lytic-looking areas of bone [Figures 7.9 & 7.10]. Otitis media may fully heal or be reoccurring. For an individual that constantly suffers this type of infection, the bacteria may spread into the cranial cavity infecting meningeal arteries and other areas of blood supply which could lead to gradual septicemia (Auferheide & Rodriguez-Martin 1998: 253).

Death resulting from bacterial meningitis secondary to the ear infection is a strong possibility (Auferheide & Rodriguez-Martin 1998: 253; M. Liston 2011, personal communication). This outcome is very serious and not only could affect the individual's hearing but also life span. The endocranial infection's cause is unknown but it cannot be ignored that there is a correlation between severe ear infection and meningitis which, if prolonged, could have caused the sclerotic polishing, diploe expansion, and cortical bone thickening. Similar infectious characteristics are seen among the population at Liatovouni which has been tentatively identified as brucellosis (M. Liston 2011, personal communication).

Additional Non-Infectious Pathologies

Hyperostosis Frontalis Interna (HFI)

Much research has been conducted about HFI spanning from Homonids, ancient populations, and modern forensic cases (Armelagos & Chrisman 1988; Anton 1997; Barber et al. 1997; Hershkoitz et al. 1999; Ruhil & Hunneberg 2002; She & Szakacz 2004; Devriendt et al. 2005; Yamakawa et al. 2006; Flohr & Witzel 2010; May et al. 2010, 2011; Belcastro et al. 2011; Flohr & Witzel 2011). With all the work that has been done, the etiology of this pathology was not defined until recently and it is agreed that HFI is a result of hormonal stimulation (She & Szakacz 2004:206; Flohr & Witzel 2010: 30; Hershkoitz et al. 1999).

Hyperostosis frontalis interna is visually characterized by benign bone growth on the endocranial surface of the frontal bone. Hyperostosis frontalis interna also can vary significantly in shape and size but consistently is on the endocranial surface of the frontal bone either bi- or unilaterally present (Hershkoitz et al. 1999:306). HFI only recently has been recognized as an independent pathology. In the past it was associated with Morgagni-Stewart-Moral-Moore syndrome which included symptoms like headaches, obesity, neuropsychiatric symptoms, and virilism (May et al. 2010:1). HFI is more consistently considered an asymptomatic pathology (2010:1). Moreover, HFI is considered rare among ancient and historic populations (Flohr & Witzel 2010:303; Barber et al. 1997:157). HFI's presence increases with age more often in women than men (May et al. 2010:1), especially among postmenopausal women (Hershkoitz et al. 1999:304).

As mentioned, HFI has links with behavioral disorders among forensic cases. According to Yamakawa and colleagues (2006:201; Devriendt et al. 2005), HFI could be caused by neuropsychiatric abnormalities including behavioral disturbances such as

“schizoaffective disorder.” Suffering from schizoaffective disorder either in modern or ancient times is quite serious. In clinical terms, an individual suffering from schizoaffective disorder is out of touch with reality as it is a combination of a thought and a mood disorder (DSM-IV-TR:319). Even with modern medicine, it is the most difficult disorder to medically treat and is almost impossible to properly treat the symptomatic sensory misperceptions (auditory, tactile, and visual hallucinations) (S. Graff, personal communication). An individual out of touch with reality having powerful hallucinations without modern medication potentially would be deemed a social outcast and may be accorded differential burial as a result.

Developmental Anomalies and Defects

Not all developmental axial skeleton disorders are life threatening or altering. All that might be affected is a person’s aesthetic appearance. Both Stafne defect and bilateral mandibular hypoplasia are benign axial skeletal disorders (Barnes 1994).

Stafne defect is the development of a lone cyst that occurs when a deep cavity is created by the premature development of “the sublingual salivary gland” (Barnes 1994:170; Stafne 1969). Most often the cyst is located in the area of the third molar inferior to the mylohyoid line (1994:170). The defect also tends to appear in men among worldwide populations (1994:170). Stafne defect is considered a developmental defect, but it has been documented to occur among middle aged individuals as well (Barnes 1994:170; Stafne 1969).

Bilateral mandibular hypoplasia is caused by delayed growth of the mandible’s ascending ramus. Mandibular hypoplasia is most often seen unilaterally. Among 20-30% of

diagnosed cases are bilateral and tend to be less noticeable than unilateral mandibular hypoplasia (Barnes 1994:162). .

Auxiliary Ossicles

Auxiliary or supernumerary ossicles vary among modern and ancient populations. Auxiliary ossicles are considered a hypostatic characteristic among epigenetic variation traits (Ossenberg 1970, Manzi et al. 2000, Hanihara & Ishida 2001:689). There are many variations of auxiliary ossicles but here the Inca bone will be the focus.

Inca bones are located at lambda and possess no functional purpose among the other cranial bones (Hauser & De Stefano 1989:99) [Figure: 5.4]. Inca bones are created by the failed fusion of occipital squama portions as a subadult (Hauser & De Stefano 1989:99). In addition, inca bones are more prevalent among men than women and are less frequent among mature individuals (1989:99). Moreover, studies have shown that the presence of Inca bones is genetically influenced (Hauser & De Stefano 1989:99; Torgersen 1951).

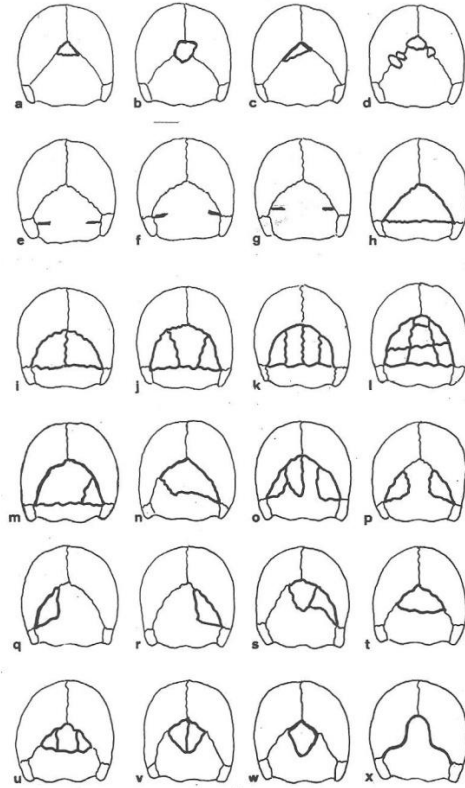


Fig. 15. 1. Variants of ossicle at lambda: a) protruding more into the occipital, b) protruding mainly into the right parietal and the occipital squama, c) protruding mainly into the left side of the occipital squama, d) protruding equally into the parietal bones and into the occipital squama, in addition there are two lambdoid ossicles on the left and one on the right side.
 2. (e-g) Variants of a persisting sutura mendosa: e) bilaterally originating below the asterion, f) bilaterally originating in the asterion, g) bilaterally originating above the asterion.
 3. (h-w) Variants of occipital squama ossification: h) complete, undivided inca bone, i) complete symmetric bipartite inca bone (median suture), j) complete tripartite inca bone, k+l) complete multipartite inca bones, m) complete asymmetric bipartite inca bone, n+o) incomplete asymmetric inca bone variants, p) incomplete symmetric bipartite inca bone, q-s) incomplete asymmetric inca bone variants, t-w) incomplete median inca bone variants (v and w are sometimes termed "Spitzenknochen or preinterparietal bone), x) pars incoidea squamae occipitalis.

Figure 5.4: Hauser and De Stefano's Inca bone chart (1989:101, fig. 15)

CHAPTER 6: **ARCHAEOLOGY AND BIOLOGICAL ANTHROPOLOGY: AN UNEASY ALLIANCE**

What is Bioarchaeology

Bioarchaeology certainly has become its own science since Jane Buikstra coined the term in 1977 (Schepartz 2009; Larson 1987, 1997; Armelagos & VanGerven 2003).

Bioarchaeology developed from the questions regarding demographic relationships among populations that were not able to be fully addressed within the boundaries of physical anthropology. Skeletal biological methods were the first step toward the creation of bioarchaeology and, despite being criticized for controversial racially based data and interpretations, these methods have paved the way for modern paleopathological methods and interpretation for environmental adaptation according to biology (Armelagos & VanGerven 2003:55-6). With the progression of anthropology, archaeology, and skeletal biology, the inevitable happened as these fields began to overlap and share the methods of processual archaeology, which in turn created the field of bioarchaeology (2003:58; Buikstra 1977).

In order to be a contribution toward science, bioarchaeology must possess three factors. First, bioarchaeology must continually maintain “a population perspective”. Second, it must consider the biological adaptations that result from interacting with the surrounding environment. Third, bioarchaeology requires testing methodologies than incorporates the relationship between the cultural and biological aspects of a population (Armelagos & VanGerven 2003:58).

Influential Anthropological Theory

During the past few decades, archaeological theory surrounding cemetery investigations has been a “battle ground” (Buikstra & Lagia 2009:9). There are two different theoretical schools with ongoing debates about the matter. The first school is the 1960s and 1970s approach to archaeology known as processual archaeology (2009:9). This was created by James Brown, Arthur Saxe, and Lewis Binford (Binford 1971; Saxe 1970; Brown 1971; 2009:9). This approach places the emphasis “upon the grave tomb, with variation in treatment of the dead, grave wealth, and tomb elaboration assumed to reflect social status of the deceased” (2009:9).

The second school is a more recently developed approach that is centered around interpretive or contextual archaeology, with an emphasis on the living rather than the dead, because it is the living individuals who bury the dead and administer the funerary ritual (Hodder 1980, 1982; Parker Pearson 1982; Buikstra & Lagia 2009:9). Moreover, the living community’s involvement with the dead promotes political, economic, and social “competition” (2009:9).

Still in recent research, the Saxe-Binford-Brown method is the more often used as it still possesses anthropological clout (Morris 1991; Buikstra & Lagia 2009:9-10). Recent work has shown that the emphasis on the ancestor is not only significant to the living but also serves as a means to claim necessary resources including land and water (2009:9-10). Thus the location of cemeteries is not random and brings up several other questions about Aegean burial practices (2009:9-10). The theoretical trend in Greece has been moving away from

“Classical” thinking, and instead is integrating anthropological approaches⁷ to bioarchaeological investigations (2009:9-10).

A Brief History and Current State of Physical Anthropology in Greece

Interest in the study of human bodies extends far back into Greek antiquity.

Physiology and medicine were fields of interest among sixth century BCE philosophers and physicians including Hippocrates and Democedes (Eliopoulos et al. 2011:173). The science of dissection during the Roman era bolstered the knowledge of the human body including anatomy, pathology, neurology and osteology (2011:173). This tradition of curiosity carried on into modern Greek society, led by the work of Klon Stephanos.

The Anthropological Museum of Athens was founded in 1886 by the efforts of Stephanos, who was heavily influenced by the anthropological strides of French surgeon Paul Broca. With the assistance of their colleagues, both Broca’s and Stephano’s anthropological foci were geared toward archaeological skeletal analysis (Eliopoulos et al. 2011:173). By 1974, the Anthropological Museum of Athens had already employed several prominent physical anthropologists as directors, and the field was then recognized by the Greek government. Aris Poulinanos, a USA and Soviet Union educated anthropologist, supported by the Anthropological Museum of Athens, “established the Ephorate of Paleoanthropology and Speleology under the auspices of the Ministry of Culture” (Eliopoulos et al. 2011:173). Since Poulinanos, anthropological interest has remained invested in skeletal analysis with the

⁷ A few examples of this approach include the following: Liston 1993, 2007; Fox Leonard 1997, 2005; Triantaphyllou 1998, 1999, 2001; Little and Papapoulos 1998; Rotroff, Little, Snyder 1999; Garvie-Lok 2001; Hillson 2002; Bessios and Triantaphyllou 2002; Bourbou 2003, 2004; Liston and Papadopoulos 2004; Grammenos and Triantaphyllou 2004; Bourbou and Richards 2007; Iezzi 2006, 2009.

emphasis on the continuity between ancient and modern Greek biology (Eliopoulos et al. 2011:173).

Several institutions within Greece have been established to reinforce this thriving science, including the Department of Animal and Human Physiology and the Forensic Anthropology Unit at the National and Kapodistrian University of Athens, the Laboratory of Anthropology at Democritus University of Thrace, and of course the Ephorate of Paleoanthropology and Speleology (2011:175). In addition, laboratories at two foreign archaeological schools, the Malcolm H. Wiener Laboratory at the American School of Classical Studies at Athens, and the Fitch Laboratory at the British School in Athens, have facilitated the collaboration of Greek and foreign students and faculty. These research units collectively provide bioarchaeological research facilities, house comparative human skeletal collections, investigate biocultural demographics and population adaptation, and often provide funding for appropriate graduate or doctoral level research (2011:175).

In addition, anthropological museums like those in Athens and Petralona have been significant to the growth of the bioarchaeological field in Greece (2011:176). Both museums promote the multi-faceted disciplines of anthropology as well as conservation and paleoanthropological research (2011:176). In addition to Greece's growing anthropological research facilities, there are two physical anthropology associations, the Hellenic Anthropological Association (1924) and the Anthropological Association of Greece (1971) (Eliopoulos et al. 2011:176).

Despite the spread of institutions that support biological anthropological research, there are few opportunities for students to study the topic in Greece. Since there are no

physical anthropology departments at Greek universities, international education has been a necessity for Greek students wishing to pursue the study of biological anthropology. More often than not, Greek anthropology students and professionals are studying abroad rather than in Greece (Eliopoulos et al. 2011:175-177). This has had the result of exposing Greek students to a wide array of traditions in anthropology, which they bring home with them when they return from their studies. This has enabled physical anthropologists, Greek institutions, and neighboring countries to collaborate (2011:175). In addition, over the past few decades several prominent Greek physical anthropologists have had considerable influence in this field. The works of A.P. Agelarakis (1995, 1997) and G. Armelagos (1988, 2003) have become some of the more influential research conducted by Greek bioarchaeologists in North American universities (Eliopoulos et al. 2011:174).

Bioarchaeology in Greece

With the collaboration and influence of scholars and anthropology departments outside of Greece, positive attention has been brought to the scientific and archaeological significance of human remains (Eliopoulos et al. 2011:175). Biological anthropology in Greece begins in time with the comparison of Middle Pleistocene inhabitants in Greece to the Neanderthals from other regions, and continues down in time to studies of modern Greek populations' genetic identity (Schepartz et al. 2009:3). Moreover, osteological analysis has been carried out almost in every region of Greece from Macedonia to Crete (2009:13). Schepartz and colleagues suspect that the success of bioarchaeology in Greece occurred due to the nature of the ancient and modern samples (2009:2).

Greece is a region where there are many challenging questions of population affinities and interactions across space and time, where the range of natural environments led populations to selectively exploit local and nonlocal resources, and where the development of social complexity involved many polities and had far-reaching effects throughout the Mediterranean and even more distinct regions (Schepartz et al. 2009: 2).

Much work has been done with Greece's ancient and modern skeletal collections. To date, J. Lawrence Angel has accumulated the most data about Greek skeletal biology and bioarchaeology (Eliopoulos et al 2011:174; Schepartz et al. 2009). His work throughout the twentieth century included both ancient and modern Greek populations. Angel's publications discussed a range of topics including race, ancient Mediterranean pathologies, length of life, and metric and non-metric traits (Angel 1945, 1946, 1959, 1964, 1966, 1967, 1971, 1973; Angel & Biesel 1986; Schepartz et al. 2009; Eliopoulos et al. 2011:174). Mirko D. Grmek also significantly contributed toward the study of paleopathology among ancient Greek populations (1983). Grmek utilized ancient descriptions with skeletal data (Eliopoulos et al. 2011:174). This method enabled him better understand, if not fully reconstruct, the ancient Greek civilization health profile (2011:174).

Following the work of these earlier scholars, over the past few decades Greece in particular has flourished as a leading country where osteologists, paleopathologists, and archaeologists have begun to cohesively work together in order to better understand a population as a whole including dietary, occupational, and cultural habits rather than just the archaeological material (Schepartz 2009). This cohesive collaboration between the bioarchaeology and archaeology worlds is recent, and often excavations do not have trained osteologists in the field. Certainly there are archaeological situations when it is unnecessary,

but when excavating a cemetery, ancient, historic, or modern, it would be prudent to have bioarchaeologists present. Though this seems logical, it has not been a part of the archaeological protocol for Greek excavation until recent legislation, permits, and funding agencies have suggested this inclusion.

Recent regulations have certainly established that human skeletons are protected antiquities, and must be excavated properly, but the law does not require an osteologist to be in the field during excavation (Government Gazette 153/A/2002; Eliopoulos et al. 2011:179). However, anthropologists also have to address the issue of traditional perceptions among archaeologists regarding archaeological human remains. Many archaeologists have assumed that human remains provide no data of substance and this has led to the loss of archaeological context due to selective bone recovery during excavation. Another conundrum is the long-term storage of excavated human remains without conducting any osteological analysis. In order to understand the relationship between archaeology and osteology in Greece, one requires a full understanding of the development and current state of bioarchaeology. I want to address these topics more fully, as they together constitute an important public issue, involving the interactions of government, academics, land owners, and funding agencies, both public and private.

The “Insignificance” of Human Remains

Respect for the scientific value of human skeletons took a long time to develop in archaeology. The biological material was, for a long time, not considered to be as valuable as material artifacts such as ceramics or metal objects. Even when bones were saved, they often

were collected as curiosities, without any contextual information. This mentality was not unique to Greece. Egyptian mummies at times were used as firewood and Native American burials were looted for the artifacts and the skeletal remains were disregarded or destroyed (Highet 2005). These are two dramatic examples, but they demonstrate that ancient human remains were treated as inferior to archaeological material culture.

In Greece, skeletons were inconsistently saved in early archaeological sites. For example, from the earliest excavated graves in the Athenian Agora, less than 20% of the skeletons identified in excavation notes were preserved for later study (M. Liston, personal communication). Skeletons that were saved from many early excavations have almost no associated information, and may not be noted on inventories and plans, particularly if they were not associated with grave offerings. Unfortunately, this has resulted in the loss or destruction of unique data that will never be recovered, as well as the loss of context for collected artifacts and remains. Without knowing the archaeological context of human remains, there is no definitive means to interpret the data skeletal remains can yield.

Incomplete Recovery of Skeletal Materials

Archaeological skeletons that are available for studies are frequently incomplete. Only the bones that were thought to be significant, either scientifically or archaeologically, were collected rather than the entirety of the material. To the untrained eye, robust bones such as the femur and tibia as well as the easily identifiable portions like the cranium were often collected leaving the rest of the individual(s) behind (Liston 2008)

These occurrences cannot be fully blamed on the non-osteologically trained archaeologists, as leading anthropological experts were doing the same during the twentieth century. For instance, Ales Hrdlicka, the founder of the American Physical Anthropological Association, condoned and participated in grave robbing for the sake of anthropology. For instance, there are documented cases when he exhumed corpses from cemeteries that were still in use (Highet 2005:428). As recently as 1929, Dr. Hrdlicka disturbed the graves of adults and children and took what specimens he saw fit (Dumont 2003). Moreover, Franz Boas also stole Native American remains for profit and kept detailed records noting the income he hoped to receive for his assiduous bone collection (Dumont 2003). This type of selective bone collection heavily affects demographic data and skews interpretations (Angel 1947). Angel heavily documented this type of selection among the Athenian Agora skeletons (1947).

Storage Without Analysis

Each country in the world has a particular opinion about the treatment of human remains and the presence or lack of legislation reflects these attitudes (Marquesz-Grant & Fibiger 2011). Around the world there are excavated collections of human remains, both modern and ancient, that are stored but have yet to be analyzed. For instance, in the United States, prior to the Native American Grave Protection and Repatriation Act (NAGPRA)⁸ the Smithsonian Institution in Washington D.C. and Peabody Museum of Harvard University

⁸ The Native American Grave Protection and Repatriation Act, which came into effect on November 16, 1990, states that “each Federal agency and each museum which has possession or control over holdings or collections of Native American human remains and associated funerary objects shall compile and inventory of such items and, to the extent possible based on information possessed by such museum or Federal agency, identify the geographical and cultural affiliation of such item.” Items for determining cultural affiliation by tribes and federal agencies alike include “geographical, kinship, biological, archaeology, anthropological, linguistic, folkloric oral traditional, historical or other relevant information or expert opinion” (Mayes 2010:26)

housed the remains of thousands of individuals, both Native American and from around the world (Ousley et al. 2005: 2). Even though these collections are considered an “empirical basis for determining the ancestry of individuals whose remains will be discovered in the future” (2005:2) still most skeletons remained minimally analyzed.

Archaeological Human Remains and Legislation in Greece

In Greece archaeological excavations have taken place for over a century throughout the country, resulting in vast quantities of archaeological material needing to be stored and analyzed. All construction or related public activities that occur in archaeological areas are completely under the control of the Ephors, which are government-appointed representatives for the maintenance of various aspects of Greek culture (Eliopoulos et al. 2011:177). They are responsible for “the identification, study, excavation and protection of monuments, in addition to educational programs and related events for the promotion of cultural values to the public” (Eliopoulos et al. 2011:177).

Various parties are given the legal right to conduct archaeological excavations. These include the Ephorate of Antiquities, various Greek scientific, research or educational organizations, and institutions that have members who conduct archaeological or paleontological research, and the sixteen foreign archaeological schools established in Greece, including the American School of Classical Studies at Athens and the Canadian Institute in Athens. The Ministry of Culture oversees all rescue excavation efforts and the excavation director must be appointed by the Ministry (Eliopoulos et al. 2011:177).

Excavation Permits

Excavations in Greece require permits issued by the Minister of Culture. Permits for foreign scholars are limited, and must be issued through one of the foreign archaeological schools. There are several requirements necessary for permit approval including but not limited to providing evidence that the area in question will yield a viable archaeological site, the interested excavators' institution is legitimate, the director is experienced and scientifically qualified, and the degree of "experience of the team members in the conservation, protection and publication of the finds" is sufficient (Eliopoulos et al. 2011:177). Issued permits are valid for only five years before permission must be renewed. The law also requires that a preliminary inventory of artifacts is presented within two years of the final excavation season, and that the final publication is completed within five years of the excavation's completion (Eliopoulos et al. 2011:178). In the case of human remains being uncovered during excavation, first it has to be determined if the remains are of forensic concern. If the human remains are of archaeological concern it is an issue of the Ephorate of Antiquities, and they are subject to the same requirements as any other archaeological material.

This system seems straight forward but like many laws there are loop holes. Once the preliminary reports are completed and submitted to the government it can be very difficult for other scholars to gain access to archaeological materials. Permits to re-examine published material, or unstudied collections can take a minimum of 4-7 months to acquire, and are not infrequently denied (S. Fox, personal communication).

A further problem is that once someone is given permission to study material, in practice, if not in law, they are under no obligation to actually do so. The exclusive

permission to study is granted indefinitely, blocking all other scholars, even after the permit holder has retired or ceased to work in the field (M. Liston, personal communication). This is why it is imperative to have a collaboration with the permitted excavator and the bioarchaeologist.

Only when J.L. Angel began to demonstrate the importance of skeletal analysis in Greece did bones become a recognized source of archaeological data. For the past 80 years, human remains have been subjected to less archaeological bias or selection. Instead, they are excavated and stored, waiting years or decades before they are analyzed. The delay in analysis and prolonged storage can lead to the mixing and loss of materials which results in loss of archaeological context. Skeletons stored uncleaned in cardboard boxes frequently are also subject to considerable post-excavation damage.

Although many excavators began to collect skeletal remains systematically many years ago, the preservation and protection of archaeologically significant human remains has only recently been officially mandated by the Greek government. All archaeological cultural material, including human remains, have been protected only since 1830 when the independent Greek State was established (Eliopoulos et al. 2011:179), however this “protection” was not enforced by law and not until the twenty-first century was the protection of human remains a legal issue of cultural preservation.

The implementation of the legislative preservation of human remains has been problematic. With constant excavations throughout Greece there are both expected and unexpected situations in which human remains are found (Eliopoulos et al. 2011:179), resulting in inconsistent participation of trained osteologists. For instance the Athenian Agora

excavators expect to find human remains every season, and call upon the Wiener Laboratory when bioarchaeological assistance is needed. Other archaeological excavations do not anticipate finding human remains, and do not arrange for appropriate specialists in the field. Moreover, excavations in Greece can be rather remote and calling upon a bioarchaeologist may delay the progress of the excavation, so some archaeologists deliberately avoid or ignore burials.

The legal protection of human remains rests on their inclusion with other antiquities, and they are not referred to specifically in the relevant legislation, Law 3028/2002 on the ‘Protection of Antiquities and Cultural Heritage in General’ (Government Gazette 153/A/2002) (Eliopoulos et al. 2011:179). This law only came to being in 2002 and is enforced by the Ministry of Culture (Government Gazette 153/A/2002, 3003).

Although cultural objects are not specifically named in the law, the term is used to describe testimonies of the existence of human activity. Human remains coming from archaeological contexts are thus regarded as ‘cultural objects’ and, more specifically, as portable monuments. Immovable monuments, on the other hand, are specified in the Law 3028/2002 (Government Gazette 153/A/2002, 3003) and include cemeteries. The excavation, recovery, protection and study of human remains, therefore, fall under Law 3028/2002, and all issues related to their treatment are subject to the same legislative controls as any ancient monument (Eliopoulos et al. 2011:179).

Likewise, excavation directors are instructed to facilitate access to the site for specialists (Government Gazette 153/A/2002, 3017), but their presence is not required during excavations (Eliopoulos et al. 2011:179). This reality delays the sharing of archaeological data, inhibits proper and necessary preservation precautions, and causes recovered human remains to be susceptible to misplacement. It is the responsibility of the permit holder to see that all cultural material be treated and analyzed properly by the appropriate specialists.

Bioarchaeology of Kallithea Laganidia

Since Kallithea Laganidia was found accidentally, thus qualifying as a rescue excavation, the Ministry of Culture was responsible for appointing an appropriate excavation director for the project. This director, Thanasis J. Papadopoulos, completed his doctoral research on Achaean, and had continued to conduct research in the area for the past few decades.

Despite the legislation that the team chosen for these projects be experienced and appropriate for the work, there was never a permanent osteologist among the excavators even though the site was a cemetery (E. Papadopoulou-Chrysikopolou, personal communication). This could have been a problem, but fortunately the material was excavated well and the director and associated excavators are interested in the data osteological analysis could provide. Moreover, the director saw to it that the material would be analyzed and treated properly by signing over the permit rights to Dr. Sherry Fox of the Wiener Laboratory. The excavator's willingness to meet the requirements of the legislation of the Ministry of Culture provided me the opportunity to examine the material, the collaboration between osteology and archaeology to occur, and, more importantly, the bioarchaeological data of the Kallithea population to be documented.

There has been some delay since most of the excavation was not subject to the legislation requiring rapid analysis because the excavation was near completion in 2002. This allowed material to be stored without being analyzed for many years. The prolonged storage

of these remains, although authorized and in compliance with the Ephor, led to the displacement of not just archaeological materials, but of people.

There was no initial catalog taken when the material was put into storage, the material changed locations from one museum to another over the years, and despite the permit being held by Papadopoulos some human remains were handed over to individuals without authorization or permit. Moreover, when the boxes of human remains arrived at the Wiener Laboratory, it was assumed that all of the Kallithea Laganidia human remains had been delivered. Not until this project in 2011 was it realized that not only were the contents of some tombs missing, but also that human remains had been lost. All of these factors have contributed to the challenge of producing a complete study of the site.

CHAPTER 7: RESULTS AND DISCUSSION

Demography

Although the sample is small, and includes only 5 of the tombs from Kallithea Laganidia, the results of this study have been promising. The demographic and paleopathology data both present useful observations on the Mycenaean inhabitants, and provide indications for productive further study of the site. Moreover, the data recovered is useful for evaluating the mortuary practices of the group that produced the Kallithea Laganidia cemetery. The five tombs contain 38 individuals representing both men and women including 33 (86.8%) adults and 5 (13.2%) subadults [Table 7.1].

Age and Sex Determination

In gathering demographic data, it is generally agreed that the pelvis area is the most accurate skeletal sex and age indicator (Angel 1947:21; Lovejoy et al. 1985). However, the ossa coxae are fragile and can easily decay over time or are often damaged during excavation. At Kallithea no complete pelvises survived and only 27 ossa coxae fragments were recovered among the primary and secondary burials of the five tombs. These fragments represent only 10 individuals. Utilizing what was available, the cranial indicators of age and sex were heavily depended upon for demographic data as the crania were consistently well preserved and represented almost each of 38 burials within the sample. However, when ossa coxae

fragments were available, they were utilized in conjunction with the cranial fragments and available dentition⁹ to more accurately determine sex and age.

Children

As mentioned before, Mycenaean children interred in extramural cemeteries are rare (Mee & Cavanaugh 1984; Angel 1947). All of the subadults were secondary burials. Four of them were identified by very few skeletal remains or just a single bone like that of Burial H of Tomb XX (a left rib) and Burial B of Tomb XIX (an unfused petrous portion).

These five subadults represent 13.2% of this sample which is a prominent portion. This was unexpected because there is so little comparative subadult extramural burial data. A few scenarios could have influenced this void in Mycenaean subadult information.

The small size and gracility of subadult bones causes them to be easily affected by taphonomic changes. This resulted in poor preservation or complete deterioration of most of the subadult bone. In addition, it is possible that Mycenaean cemeteries have been excavated with a biased or an untrained eye which has caused a skewing of the subadult data (Angel 1947:22). As mentioned in Chapter 6, this type of bone selection not only occurred at the Athenian Agora, but also has heavily skewed the bioarchaeological data of Attica. Luckily, only poor preservation influenced the recovery of subadult bones at Kallithea Laganidia. If there was bias against the recovery of subadult individuals, by mistaking these bones for small

⁹ Only 3 of the 5 tombs have os coxae fragments. Tomb XX had three from the secondary burial remains belonging to at least one individual. Tomb XVI had a total of sixteen fragments: six belonging to primary burial A, four belonging to primary burial B, and six fragments belonging to at least three individuals among the secondary remains. Finally tomb XV had a total of fourteen fragments: three belonging to primary burial M, four belonging to primary burial B, and seven fragments belonging to at least two individuals among the secondary remains. Tombs XVIII and XIX contained no os coxae fragments.

animal bones, or through poor excavation methods, few or none of the subadult remains would have been collected. However, it should be mentioned that three of the five subadults were identified during the osteological analysis and not during excavation, which is another indication of why bioarchaeological collaboration should be included in archaeological projects.

Sex Distribution

Sex was determined using the methods outlined in Chapter 4. Cranial morphology and ossa coxae fragments were used to determine sex if and when these elements were available (Buikstra & Ubelaker 1994). Of the 38 individuals, 11 were of undetermined sex. When there were no preserved skeletal indicators of sex an individual was identified as “indeterminate (IND)”. Poor preservation of cranial bones and pelvises made determining sex of an individual rather difficult.

Of the total sample, 17/38 (44.7%) were female, 10/38 (26.4%) were male, and 11/38 (28.9%) were indeterminate which included the five subadults as well as the two individuals found in the dromos of Tomb XV [Table 7.1]. Thus, there are only nine individuals of indeterminate sex from within the five chamber tombs. A χ^2 test ($p=0.1779$) indicates that there is no significant difference in the proportions of males and females among the individuals that could be sexed. This is similar to the Mycenaean individuals of Messenia (Iezzi 2009) and Pylos (Shepartz et al. 2009:171), where men and women were present in approximately equal numbers in the chamber tombs.

Table 7.1: Sex Distribution

Tomb	Female ¹	Male ¹	Indeterminate ³	Tomb MNI ²
XV	7	3	5	15
XVI	5	6	0	11
XVIII	0	0	3	3
XIX	0	0	2	2
XX	4	1	2	7
Total	17	10	11	38
Percentages	44.7%	26.4%	28.9%	100%

¹ Sex determined by available skeletal markers. Female means the markers scored to be more female than male. Male means the markers scored to be more male than female. Indeterminate indicates that sex was not able to be defined due to non-metric score, preservation, or being subadult.

² Minimum Number of Individuals

³ The subadult total is included in the total indeterminate individuals. 3 from XV, 1 from XIX, and 1 from XX totaling 5. These 5 subadults represent 13.2% of the 38 individuals assessed.

Age Distribution

Cranial suture closure and dental wear were the most consistently available skeletal age indicators among all five tombs, and were used to age most of the adults. The 38 individuals all fell within the expected adult age distribution. Due to the difficulty of

assigning precise age estimations using cranial sutures and dental wear, the adult burials were assigned to only two age categories: 20-35 and 35-50 years old. The Kallithea Laganidia individuals were young to middle aged adults and averaged around 35 years old [Table 7.2], and this is similar to other contemporaneous Mycenaean cemeteries (Shepartz et al. 2009:171; Iezzi 2009).

The adult 20-35 year old range includes 42.1% of the 38 individuals examined. Of the 20-35 year olds, 11 (62.5%) were female, 5 (31.2%) were male, and 1 (6.5%) was indeterminate. There are over twice as many 20-35 year old females as male individuals. This suggests two scenarios. First, more young women were dying between 20-35 years than men. Second, both men and women within this age range were more likely to die than older individuals which can be understood by comparing the percentages. 42.1 % were young, and 28.9% were older. There are several plausible causes for this uneven distribution. These interpretations will be discussed later in this chapter.

The 35-50 year old range includes 11 (28.9%) of the sample's 38 individuals. Of the 35-50 year olds, 6 (54.5%) were female and 5 (45.5%) were male individuals. The age distribution within this group is nearly even and suggests no differences in the likelihood of death among individuals who survived into this age category. The even distribution of older men and women suggests that both sexes have an equally fair chance of survival once the 20-35 year range is surpassed.

Angel estimated that during the Late Helladic III period (1400-1150 B.C.E.) Mycenaean's mean age at death was 40.0 years for males, 28.3 years for females, and 34.1 years for both sexes on average (1947:20).). The estimate age from scoring sutural closure

was 28.0 years, which Angel found to be less accurate than the other available methods (1947:20). Using the pubic symphysis the average for both sexes was 31.9 years (1947:19). However, these estimates are less precise than would be offered today because it is now recognized that adult age indicators are much more variable than Angel estimated (Meindl, et al. 1983). For instance there is much more age variability with sutural closure than what Angel recognized. In addition, the pubic symphysis aging method has been shown to be more variable than was once thought (Brooks & Suchey 1990; Hoppa 2000).

Table 7.2: Age Distribution

Tomb	Sex ¹	Age ²							Total
		Fetal: >40 weeks old	Subadult: > 9 mos.	Subadult: 9 mos.- 1yr	Subadult: 6 yrs ± 24 mos.	Adult: 20-35 years	Adult: 35-50 years	Adult: Age Unknown	
XV	F					5	2		7
	M					2	1		3
	IND		1	1	1			2	5 15
XVI	F					3	2		5
	M					3	3		6 11
	IND								0
XVIII	F								0
	M								0
	IND							3	3 3
XIX	F								0
	M								0
	IND	1: >5mos.				1: > 21yr			2 2
XX	F					2	2		4
	M						1		1
	IND	1						1	2 7
Total		2	1	1	1	16	11	6	38
Percentages		5.28%	2.64%	2.64%	2.64%	42.1%	28.9%	15.8%	100%

¹ F = Female; M = Male; IND = Indeterminate

² Age determined by use of skeletal age markers.

Determining Age of Subadults

Age of subadults was determined with the methods outlined in Chapter 4. Tomb XV has three subadults: Burials H, I, and Ξ . Burial H is a young child around six years old, \pm 24 months [Figure 4.3]. The degree of mandibular dental eruption, confirmed by x-ray, determined Burial H's age (Ubelaker 1989; Buikstra & Ubelaker 1994:51). Moreover, the basilar and lateral occipital bones are unfused which suggests that this child is closer to five years of age (Scheuer & Black 2000: 56-7). Burial H's skeleton was the most intact of the subadults containing both crania and post crania. For instance, the mandible, large fragments of the neurocranium, and a few scapula fragments were recovered.

Tomb XV's Burial I and Ξ were collected together in the field. Burial I's cranium was heavily fragmented and only portions of the neurocranium were recovered. Only five cranial fragments including the occipital bone of Ξ were recovered. Using the human bone comparative collection at the Wiener Laboratory at Athens, Burial I was aged as an infant nine months to one-year old and Ξ was designated as an infant no older than nine months old [Figure 7.1].



Figure 7.1: Seriation of subadult occipitals, Burials E, I, Wiener Lab collection, H (left to right)

Tomb XIX Burial B is the fourth subadult, and the youngest individual found thus far at Kallithea Laganidia. Burial B was found during the osteological analysis and is represented by an unfused pars petrosa of a midfetal-life individual. Burial B is no older than five-months *in utero* (Scheuer & Black 2000:75-76).

Tomb XX possesses the fifth subadult, Burial H which is represented by a single-complete fetal left rib that was identified during the osteological analysis. The size of the rib is comparable to a non-viable fetal individual. No other fetal remains were recovered and a more defined age was not able to be determined.

The presence of these subadults is significant not only because they represent new Mycenaean child extramural burials but also because their presence suggests that the tombs are family or lineage oriented. Men, women, and children are present among the five tombs

selected which suggests that there are more children to be uncovered among the rest of the Kallithea Laganidia tombs. This data contributes greatly toward the bioarchaeological understanding of Kallithea and the Mycenaeans.

In addition, one tomb deserves particular consideration. Tomb XIX had two individuals including one adult and one fetus. The tomb's remains were in very fragmented and poor condition. Poor storage conditions had produced mold on about 25% of what was collected. Burial A, the adult, had very thin and gracile long bones which are characteristic of a young person or a young female. The dentition collected was all permanent with full root formation as well as complete bilateral eruption of the third molars. Aging the available dentition, Burial A was at least 21 years old (Buikstra & Ubelaker 1994:51; Ubelaker 1989). Moreover, due to the minimal dental wear Burial A is more than likely a younger individual (Ubelaker 1989]. It is not definitive but given the gracile nature of Burial A's bones, the presence of Burial B's fetal remains, and that the tomb only possessed these two individuals it is worth suggesting that Burial A is a young female, possibly a pregnant female at the time of death. In addition, besides the tholos the only tomb that has an amphoriskos vessel is XIX. This style of pottery is often associated with child burials (Liston & Papadopoulos 2004). It also must be mentioned that taphonomy can alter bone quality and robusticity over time and more often than not this can skew a population's sex distribution because female skeletons are more susceptible to taphonomic influences (Angel 1947:19). This reality may have impacted the preservation quality of Burial A.

Evaluation of Health

Diet and cultural activities influence an individual's lifespan. Moreover, higher social status often is reinforced by preferential treatment in life resulting in better health and a longer life. Among the 38 burials, only 28 (73.6%) individuals' remains were preserved well enough to evaluate skeletal and dental pathologies. Table 7.3 shows the distribution of skeletal pathologies among the tombs. Table 7.4 shows the demographic distribution of skeletal pathologies among males, females, and subadults. Table 7.5 shows the distribution of dental pathology among the tombs.

Several skeletal pathologies were found within the sample and these are described in Chapter 5. Briefly reiterating this information, Chapter 5 describes the paleopathology of cribra

Table 7.3: Distribution of Skeletal Pathologies

Tomb ³		XV (MNI 15)				XVI (MNI 11)				XVIII (MNI 3)				XIX (MNI 2)			XX (MNI 7)				Total MNI: 38				
		Active	Healed	NA ¹	Present	Active	Healed	NA ¹	Present	Present	NA ¹	Healed	Active	Present	NA ¹	Healed	Active	Active	Healed	NA ¹		Present			
Anemia	Cribra Orbitalia (CO)	2	3	3		1	3											1	1			10			
	Porotic Hyperostosis (PH)		2	1			3													1			5		
Trauma	Cranial Depression Fracture		3																				3		
	Hematoma				1		1																2		
Infection	Endocranial Infection ²				3				6	Unknown due to poor preservation	Unknown due to poor preservation											9			
	Inflammation of Meningeal Tracks				3																			3	
	Sinus Infection	3				1	1																		5
	Otitis Media (OM)				3				7																10
	Postcranial Periosteal Action	1																							1
	Pacchonian Depressions				2				1																

Hyperostosis Frontalis Interna (HFI)	1	1			2
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¹ NA = the skeletal area necessary for analysis was not recovered

² Endocranial infection includes thickening of the cortical bone, sclerotic-shiny surface, and/or severe thickening of the frontal bone's diploe

³ Poor preservation inhibited pathological assessment of these individuals: Tomb XV: A, Ξ ; Tomb XVI: H, K; Tomb XVIII: A, B, Γ; Tomb XIX A, B; Tomb XX: None

Table 7.4: Distribution of Skeletal Pathologies among Men, Women, and Subadults

Tomb		XV (MNI 15)			XVI (MNI 11)			XVIII (MNI 3)	XIX (MNI 2)	XX (MNI 7)			Total MNI: 38
		M	F	SA	M	F	SA			M	F	SA	
Anemia	Cribral Orbitalia (CO) ³	1	2	2	1	3	Unknown due to poor preservation	Unknown due to poor preservation	1			10	
	Porotic Hyperostosis (PH) ³		2			3						5	
Trauma	Cranial Depression Fracture		3									3	
	Hematoma	1				1						2	
	Endocranial Infection ²	1	2		2	4						9	
Infection	Inflammation of Meningeal Tracks	1	2									3	
	Sinus Infection		3		1	3						7	
	Otitis Media (OM)	1		2	4	3						10	
Other	Postcranial Periosteal Action	1										1	
	Pacchonian Depressions		2			1						3	
	Hyperostosis Frontalis Interna (HFI)		1			1				2			

¹ NA = the skeletal area necessary for analysis was not recovered

² Endocranial infection includes thickening of the cortical bone, sclerotic-shiny surface, and/or severe thickening of the frontal bone's diploe

³ Active or healed evidence of anemia

⁴ Poor preservation inhibited pathological assessment of these individuals: Tomb XV: A, E; Tomb XVI: H, K; Tomb XVIII: A, B, I; Tomb XIX: A, B; Tomb XX: None

orbitalia, porotic hyperostosis, trauma and biomechanical stress, brucellosis, meningitis, otitis media, hyperostosis frontalis interna, developmental anomalies and defects, and auxiliary ossicles. The results of the pathological analysis are fully described in this chapter.

It should be noted that the preservation was poorest in tombs XVIII and XIX where no skeletal material was in good enough condition to evaluate skeletal health. Moreover, three individuals from Tomb XV and two from Tomb XVI were not evaluated due to poor preservation. As a result, the data on skeletal pathologies were not useful for assessing social stratification because not all of the tombs were assessed and the sample therefore is very small. There was, however, an interesting pattern of sex differences seen in the pathological data.

Dental pathology could be evaluated in every tomb, unlike skeletal pathology. The methods used to evaluate dental health are described in Chapter 4; these included dental attrition, antemortem tooth loss, alveolar abscesses, periodontal disease, and enamel hypoplasia. Social stratification among the tombs is reflected by the presence of dental pathologies. Tombs closer to the tholos have less occlusal wear and antemortem tooth loss than the tombs farther away. This distribution of dental pathology reflects the social stratification seen among the burial offerings. . However, the sample was too small to fully assess if there was a relationship between dental health and age. The majority of the individuals were young adults with varying dental attrition. When the entirety of the cemetery is analyzed the age and dental health relationship should be taken into consideration when evaluating social stratification. This topic will be developed further in the dental pathology section in this chapter.

Skeletal Pathology

Cribra Orbitalia and Porotic Hyperostosis

Among the 38 Kallithea Laganidia individuals, CO and PH were not prominent [Table 7.3]. Only 12 individuals exhibited these pathologies. The poor bone preservation of 13 individuals inhibited the evaluation of CO or PH (See Chapter 5). There were 10 cases of CO, 3 of which were active at time of death, and 7 showed signs of healing. Of the twelve individuals that exhibited signs of CO and PH there were 2 males, 8 females, and 2 subadults [Table 7.4].

The three individuals with active CO included the five year old child, Burial H from Tomb XV [Figure 7.2], an older adult male from Tomb XV Burial Γ, and a young adult female from Tomb XVI Burial Γ. PH was found fully or significantly healed among five individuals.

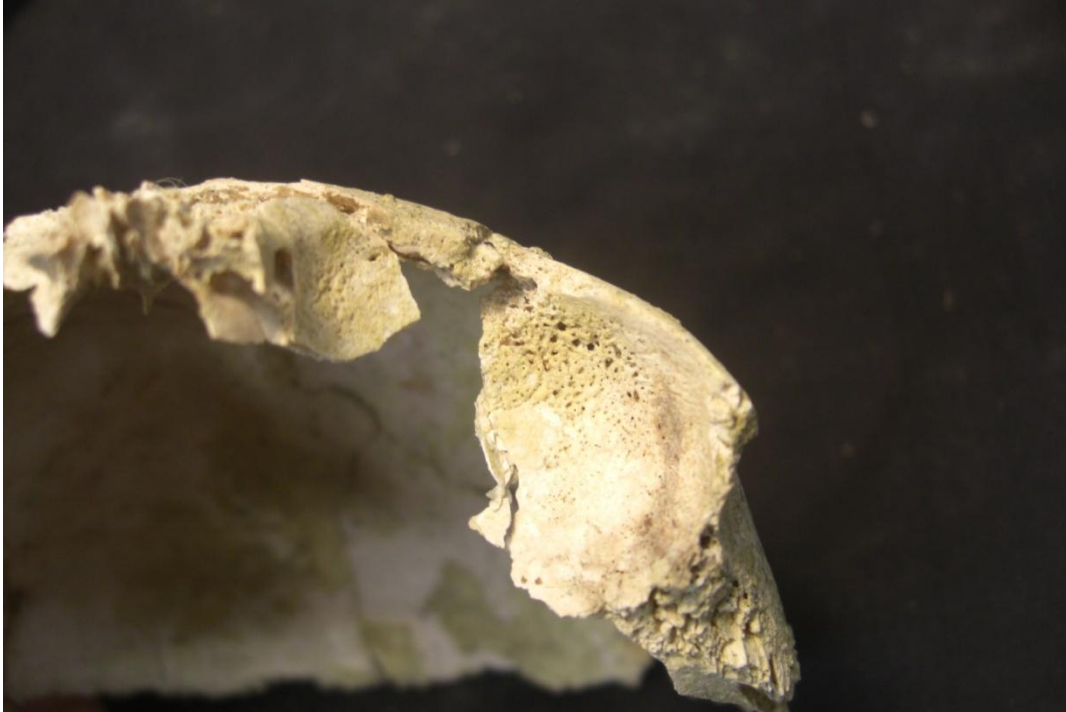


Figure 7.2: Active Cribra Orbitalia in a subadult, Tomb XV, Burial H, left orbital

There are many types of anemia present among ancient populations, including thalassemia, iron deficiency anemia, and sickle cell anemia (Ornter 2003:372). There have been very few cases of sickle cell anemia identified among ancient populations and this type of anemia affects additional areas of the skeleton (Ornter 2003:372). For this project's population the evidence of PH is cranially focused, thus sickle cell anemia is not being considered as the cause of the CO or PH. In addition, anemia can be influenced by cultural practice. Consumption of carbohydrates, low vitamin C or B-12 intake, and blood loss in women all can be a catalyst to anemia

Archaeological and isotopic analysis has shown that the Mycenaeans developed a carbohydrate-dependant, protein-deficient diet. This could influence the occurrence of CO and PH as well as tooth loss and caries (Larsen 1997:82). However, more recently it has been suggested that high carbohydrate intake contributes to the onset of anemia due to gastrointestinal infections, infestations, and breast feeding (Ortner 2003:373). Also, if the

body has prolonged exposure to infectious diseases the immune system is less able to maintain healthy levels of iron (Ortner 2003:373). This could result not only in CO and PH but also additional infectious pathologies. For instance the two children with CO could have had a gastrointestinal infection that caused severe diarrhea which led to severe anemia.

Scurvy is another common pathology, caused by insufficient vitamin C intake. and has been shown to produce lesions on the orbital shelf and cranium (Ortner 2003:390-391, Stark 2009: 40-45). In addition, scurvy affects the long bones by expanding the trabecular bone (2003:56). Rickets has a similar affect on the limbs. (2003:56). However, none of the Kallithea Laganidia individuals exhibit misshapen limbs typical of rickets. It is more likely that the causes of CO and PH among the Kallithea Laganidia sample are anemias of various causes.

Genetic anemias such as thalassemia can also cause cribra orbitalia in both modern and ancient Greek populations (Angel 1964, 1966; Ortner 2003; Auferheide & Rodriguez-Martin 1998). This genetic disease provides some immunity to malaria, thus people who tend to carry the disease are more adaptable to living in wet, swamp-like areas. Thalassemia interacts with malaria similar to sickle cell anemia in this way (Ortner 2003, Auferheide & Rodriguez-Martin 1998). Given the landscape of Kallithea Laganidia, between the mountains and the sea and surrounded by rivers, it is possible that the village Kallithea Laganidia was a marsh-like environment perfect for thalassemia-carrying individuals (Iezzi 2009: 184). However, given the low prevalence of CO and PH among the 38 individuals, it is more likely that thalassemia was not the predominant cause of CO or PH within this population. The more likely causes of the CO among this small sampling were anemia and parasitic infection.

The CO and PH present among the Kallithea Laganidia sample have an uneven distribution between men and women. Many studies have shown that, within the bioarchaeological record, women are more susceptible to anemia than men (Larsen 1997: 39; Triantaphyllou 1999:189; Iezzi 2009:185). This could be caused by physical stress related to “menstruation, pregnancy, and lactation” (Iezzi 2009: 185). Moreover if this stress begins at an early age resulting in malnutrition, a young child will not be able to catch up, thus causing several pathological problems later in life (i.e. anemia and osteoporosis) (Grauer and Stuart-Macadam 1998:32). Nevertheless, it is interesting that only two men exhibit this pathology while eight women have active and healed traces of CO and PH. This could mean that women were more susceptible to anemia because of their cultural obligations as mothers. Also, women could have been eating a heavier carbohydrate-based diet than the Kallithea men. However, CB and PH is only present among 50% of the sample and additional investigation of other tombs would be required to suggest a pattern of CB and PH among Kallithea women. Moreover, these pathologies seem to affect the younger women most. Six of the women with CO or PH belong to the 20-35year old age range and only two women are within the 35-50 year old age.

On the topic of social stratification it should be mentioned that Tomb XV contains 6 burials with CO or PH and it is present among adults and subadults and four of these individuals are female. Tomb XVI also contains 6 cases of CO or PH among adults and five are female. Tomb XX, the farthest tomb has only one adult female with CO. There are more cases of CO and PH among the closer tombs than the tombs farther away from the tholos. However, not all five tombs were able to be evaluated for CO and PH thus the presence of CO or PH cannot be used to determine social status.

Trauma and Biomechanical Stress

Trauma was not common, antemortem or perimortem, among the burials in the five tombs examined. There are five individuals with healed skeletal wounds and one individual with bilateral femoral entheopathies. There was no evidence of perimortem injuries among the evaluated individuals and besides these instances there were no other pathological traumas discernable among these individuals whose pathologies were able to be assessed.

The five individuals with healed skeletal wounds are adults represented by 4 females and a single male. Tomb XV's Burials Z, K, and Λ have healed cranial depression fractures [Figures 7.3, 7.4, 7.5, 7.6, 7.7]. Tomb XV Burial Θ (nasofrontal area of sinus) [Figure 7.8] and Tomb XVI's Burial A (left anterior tibia) [Figure 7.9] both have healed ossified hematomas.

The Mycenaean civilization was considered a warlike civilization with heavy fortification, established palaces, and a reputation among their Egyptian and Hittite neighbors as worthy adversaries (Iezzi 2009:175; Smith 2009:99). So-called "warrior" tombs have been found throughout the Mycenaean world, including Athens, Pylos, Mycenae, and Kallithea Laganidia. The artifacts found within such tombs suggest that the associated individuals possessed military honor or glory during life. Elaborate swords, knives, additional metal offerings, and higher quality ceramics reinforced the assumption that these "warrior" tombs contained individuals who had experienced or died due to battle trauma. The osteological evidence, however, suggests that these "warrior" tombs were more likely status symbols, since the remains do not exhibit any battle related ante- or perimortem trauma (Smith 1998,

2009; Smith & Liston 2010). With this in mind the social implications of the traumas among Kallithea Laganidia's sample must be considered.

In other sites, cranial fractures are more often found among men, but 4 of the 5 healed traumas belong to female individuals. Cranial depression fractures tend to occur as a result of a blow to the head which is assumed to be a result of interpersonal violence (Ortner 2003:23). Depression fractures leave a "dent" on the ectocranial surface and if there is enough blunt force trauma the dent could continue into the inner-table of the cranium (Walker 1997:151). Finding this type of trauma among ancient populations is rare because the blow likely would have resulted in endocranial bleeding followed by death. In the case of the Kallithea Laganidia's

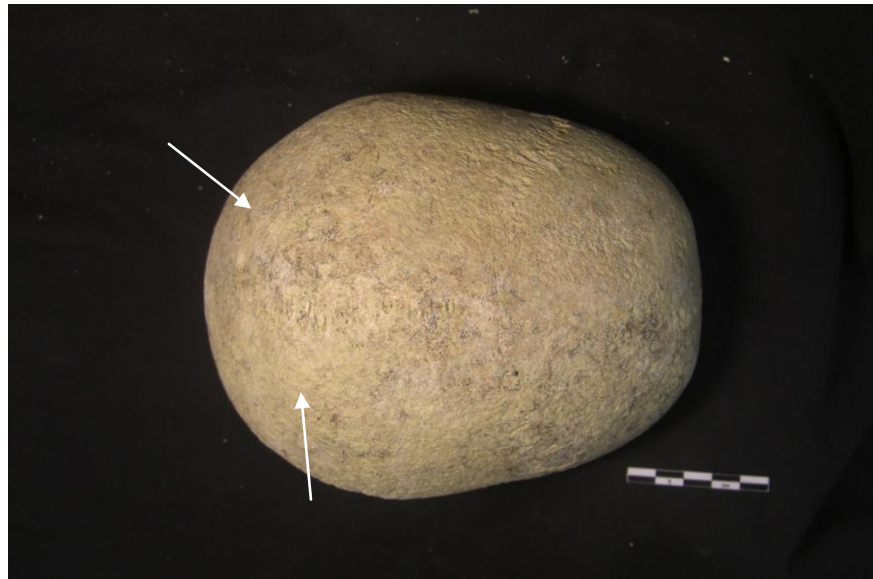


Figure 7.3: Healed cranial depression fractures, Tomb XV, Burial Z

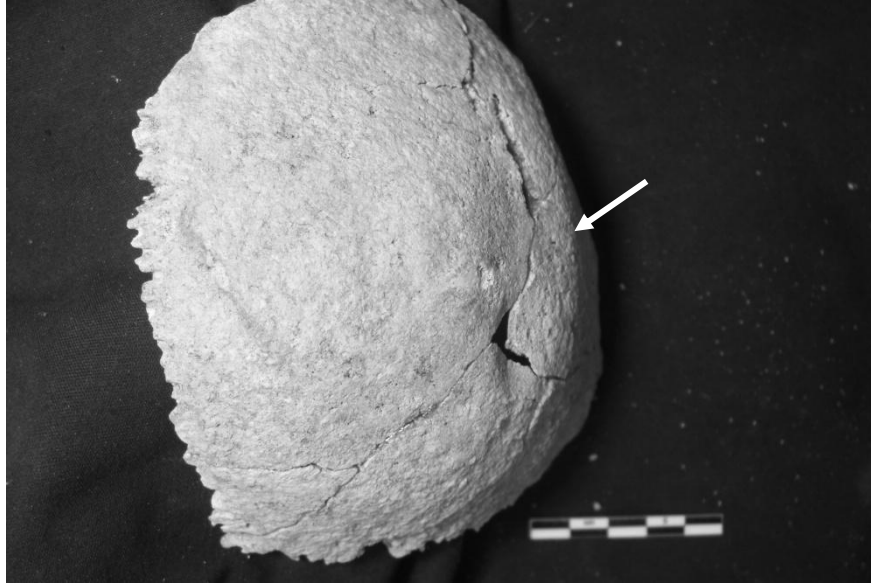


Figure 7.4: Healed cranial depression fracture, Tomb XV, Burial K, right parietal



Figure 7.5: Healed cranial depression fracture, Tomb XV, Burial K, left parietal



Figure 7.6: Healed cranial depression fracture, Tomb XV, Burial A, left parietal

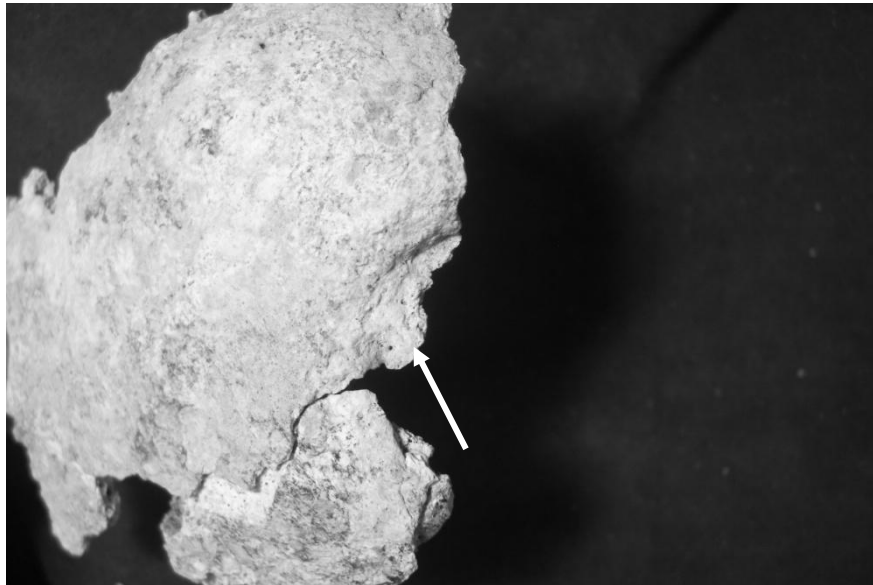


Figure 7.7: Healed cranial depression fracture, Tomb XV, Burial A, left parietal



Figure 7.8: Sinus Hematoma, Tomb XVI, Burial K

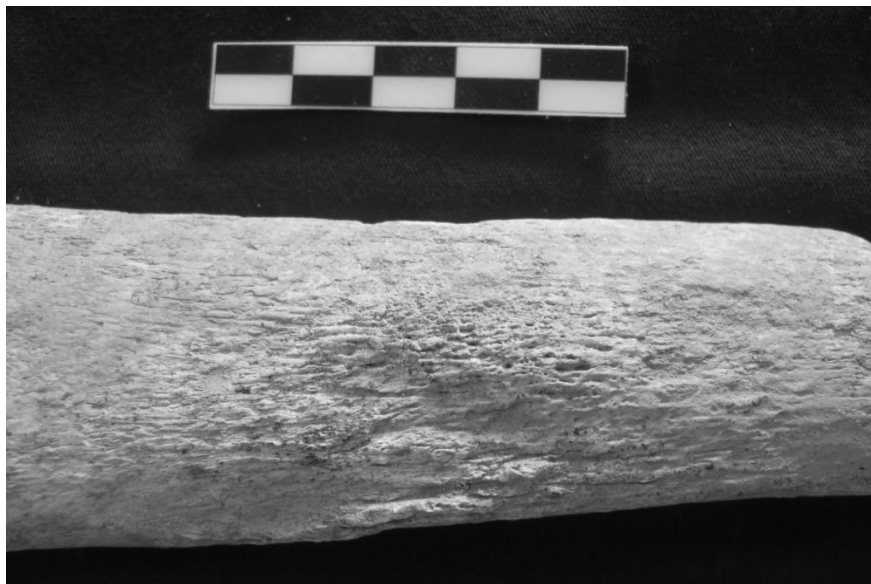


Figure 7.9: Tibial Hematoma, Tomb XVI, Burial A, left anterior tibia

depression fractures, the healed traumas appear the same as modern fractures caused by blunt force trauma (Walker 1997:151-3). For whatever the reasons, these women survived these injuries. . It appears that there is a gender related trend regarding trauma with this sample, but

the significance is unclear in this small sample. However, upon further osteological evaluation of the cemetery the Mycenaean warlike attitude and possible inclination toward domestic violence should not be forgotten.

Burial M, of tomb XV has the bilateral enthesopathies on the superiolateral third of the femoral diaphysis inferior to the lesser trochanter and lateral to the linea aspera [Figures 7.10, 7.11]. This is the insertion area for the *gluteus maximus* muscles (Capasso et al. 1998:119). As mentioned in Chapter 5, stress traumas are caused by habitual physical activity. Given the location of these enthesopathies, it can be suggested that Burial M was habitually sitting, thighs apart, on a surface that required stability maintenance. This would suggest that Burial M was not squatting down on stable ground, and if this was the case distal tibial squatting facets would be present. Unfortunately neither distal tibial portions nor the tali were recovered for Burial M.

Burial M's enthesopathies are not quite Poirer's facets. The areas of insertion are not the same, but the location of Burial M's enthesopathies and Poirer's facets close to each other and may be caused by similar activities (Capasso et al. 1998:119). Skeletal evidence from ancient Greek populations exhibit Poirer's facets and "with higher rates (44%) among women than among men (25%)" (Iezzi 2009:186-7; Poirier and Charpy 1911; Odgers 1931; Sauser 1936; Angel 1960, 1964b; Kostick 1963; Capasso et al. 1998:119). Tomb XV Burial M is the not only the lone individual possessing femoral enthesopathies among the 33 adults examined, but also is female. Interestingly, Iezzi (2009:187) did not find this biocultural skeletal marker among the East Lokris Mycenaean women. This suggests that the Poirer's facets and likely the enthesopathies of Burial M are caused by a unique activity that was not shared by many. Referring to the description in Chapter 5, horseback riding is a possible skeletally influencing

habitual activity for a Mycenaean woman, although there is little other evidence for women participating in this activity.

The archaeological material found with Burial M did not suggest anything about her occupation or daily activities in life, but does suggest that she was of an elite status. All that was buried with M was a very fine beaded necklace including Egyptian faience and semiprecious stones (E. Papadopoulou-Chrysiopolou, personal communication). The quality of the jewelry and the close proximity to the tholos suggests that Burial M was well respected and likely of high social ranking. Horseback riding was an activity of the elite during the Bronze Age (Dickinson 1977, 1994; Morris 1987). Horses were expensive to purchase and maintain. If Burial M was a Kallithean horse rider, she would have been socially significant in life and death. It will be discussed later, but in regard to Burial M's social status her very healthy dentition should also be mentioned here.



Figure 7.10: Femoral Enthesopathies, Tomb XV, Burial M



Figure 7.11: Femoral Enthesopathies, Tomb XV, Burial M

Five of the six traumas found among the sample belong to Tomb XV. Again, two of the five tombs selected were unable to provide skeletal material preserved well enough to examine pathologies; it is difficult to draw any conclusions about the closest tomb to the tholos possessing the most traumas.

Infectious Disease

Evidence of infection was found only among the burials of Tombs XV and XVI. Different types of infections were identified among Tombs XV and XVI. Fourteen adult individuals, 8 women and 6 men, possessed skeletal evidence of infection. The distribution of

infectious pathologies is even between men and women thus both groups were equally susceptible to bacterial or fungal infections.

There were five subcategories of infection present among the sample including endocranial infection, inflammation of meningeal tracks, sinus infection, otitis media, and postcranial periosteal action [Tables 7.1 and 7.2]. In many cases there are multiple indicators in the same individual, especially the endocranial periosteal bone, inflammation of meningeal tracks, and otitis media.

Endocranial Infection, Meningitis, and Otitis Media

The characteristics of the endocranial infection found among the sample [Figures 5.1, 5.2, 5.3], including meningitis and otitis media, are outlined in Chapter 5. Six burials from Tomb XVI and three individuals from Tomb XV possess the characteristics of an endocranial infection (Chapter 5). However, the exact type of infection seen among these nine individuals is unknown, thus it is necessary to conduct a differential diagnosis.

In regard to the endocranial infection of the Kallithea Laganidia individuals, brucellosis could be the cause. Brucellosis is known to cause sclerotic bone build up which could be the cause of the cortical bone thickening and sclerotic-ivory resurfacing of the endocranium (see Chapter 5). However, among the remains there were very few surviving vertebral bodies and no long bones exhibited rapid bone growth or abscesses, which are characteristics of brucellosis (Auferheide & Rodriguez-Martin 1998:192). Other infectious diseases such as malaria may cause endocranial inflammation, but none provide specific skeletal evidence.

Otitis media also should be considered in conjunction with the inflammation of meninges and the endocranial infection. Eight adult individuals, three females and five males, had severe inner ear infections that breached into the brain cavity [Figures 7.12 and 7.13]. Seven of the nine individuals with an endocranial infection also have otitis media and these have been shown to be linked in some cases (Ortner 2003:197). Only in tombs XV and XVI were there infectious pathologies identified. Again due to the poor preservation of the tombs, especially among XVIII, XIX, and XX, the data regarding the infectious pathologies noted above cannot fully represent this project's sample. Even though Tombs XV and XVI are closest to the tholos, it would be unwise to suggest that there were no pathologies of equal



Figure 7.12: Otitis Media, Tomb XV, Burial Θ, left temporal



Figure 7.13: Otitis Media, Tomb XVI, Burial Θ, left temporal
severity among the more distant tombs.

The endocranial infection's source is not yet determinable and further osteological evaluation is required. However, I do wonder if there is a correlation between the socially elite and the endocranial infection, like diet or water supply. This is completely speculative and source of the infection is still unknown.

Additional Non-Infectious Pathologies

Hyperostosis Frontalis Interna (HFI)

Hyperostosis frontalis interna (HFI) occurs in Burial Z of Tomb XV and Burial A of Tomb XVI. HFI's rarity among ancient and historic populations makes the two documented cases at Kallithea Laganidia important not only for HFI but also the pathology of the Mycenaean Achaeans (Flohr & Witzel 2010: 303; Barber et al. 1997:157). Both Burial Z and

Burial A are females aging 35-50 years old and fit the expected demographic for HFI (see Chapter 5) [Figures 7.14 & 7.15].

Both individuals from Kallithea Laganidia have Type A HFI [Hershkoitz et al. 1999, fig. 1: 307][Figure 7.16]. The HFI is unilateral with undefined margins (Hershkoitz et al. 1999:308). Hershkoitz and colleagues found that Type A is found more often among men and women of European American ethnicity anywhere from 30 to 80+ years old (1999:315). Male cases of HFI have exhibited unique pathologies related to or cultural events causing hormonal deviations including atrophied testis, hypogonadism, and castration (Hershkoitz et al. 1999: 315; Yamakawa et al. 2006:202; Belcastro et al. 2011: 632).

More recently it has been found that HFI could be an acquired metabolic disorder (Flohr & Witzel 2011). Flohr and Witzel suggest that obesity and related metabolic disorders may be a cause of HFI which would mean that a high caloric diet with little physical activity may also be characteristic of individuals with HFI. Flohr and Witzel take their argument a step further and suggest that HFI could be a characteristic of high status individuals that would have had access to a different diet and lifestyle than the majority of the population (2011:31-32). It is still difficult to pinpoint the cause of HFI.

There are interesting neuropsychological pathologies outlined in associated with HFI, but there is no evidence to suggest that Burial Z or A were social outcasts (see Chapter 5). Instead, they seem to be older women nearing menopause at the time of death and the



Figure 7.14: Hyperostosis Frontalis Interna, Tomb XV, Burial Z, frontal

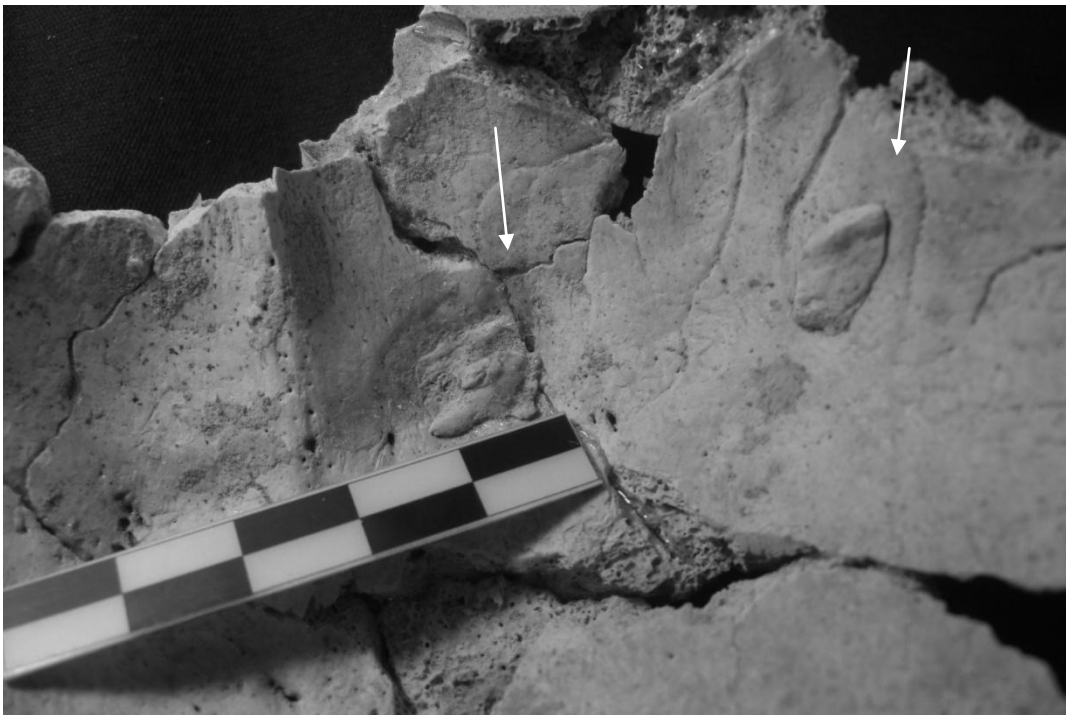


Figure 7.15: Hyperostosis Frontalis Interna, Tomb XVI, Burial A, frontal

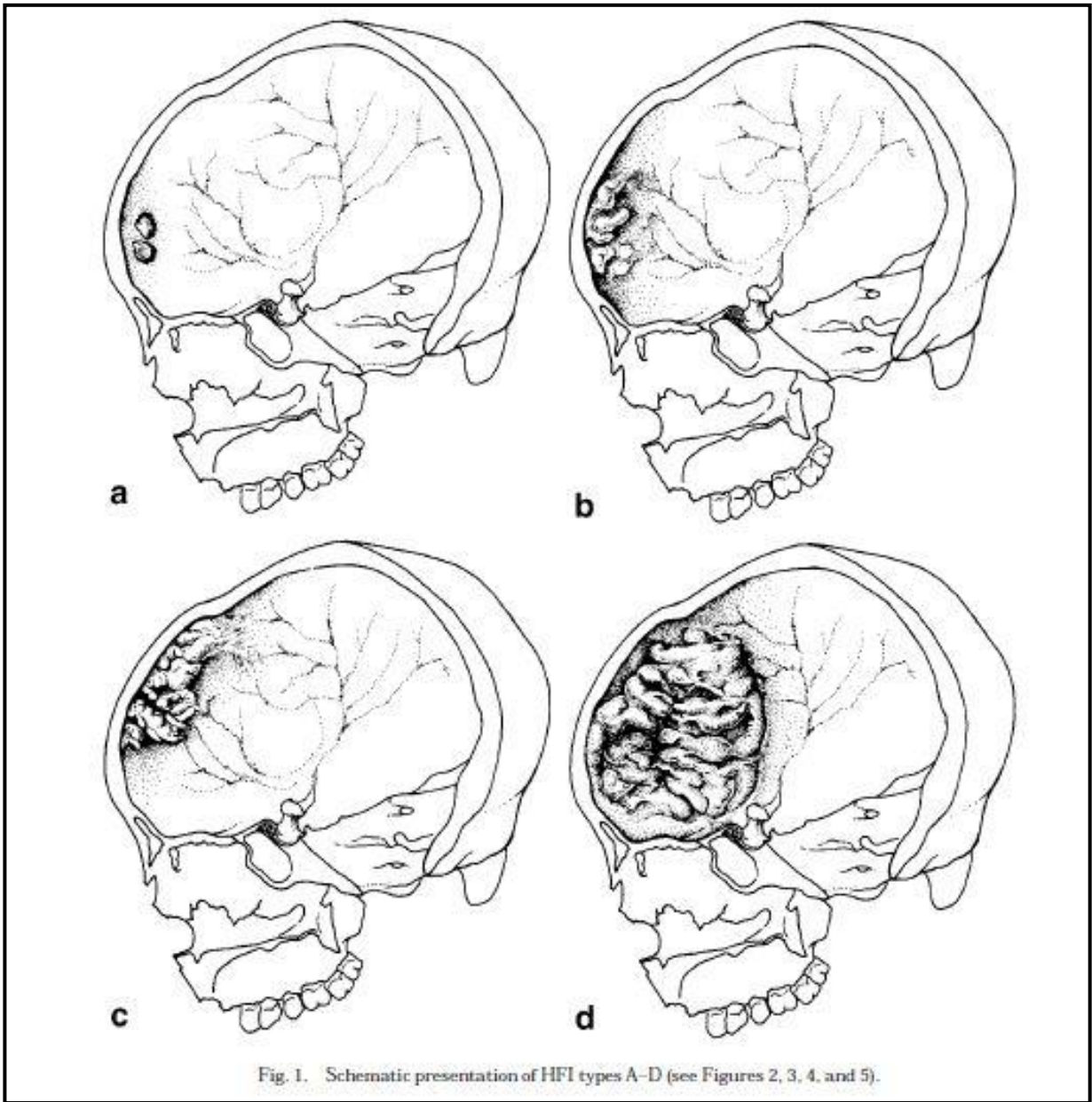


Figure 7.16: Types of HFI from Hershkoitz et al. (1999:Fig. 1p. 307)

presence of HFI confirms this. These two individuals represent 50% of the 35-50 year old females. The presence of HFI tells us that these individuals were healthy enough at a younger age to have lived to be one of the sample's older individuals.

Benign Pathologies: Developmental Anomalies and Defects, Button Osteoma, and Auxiliary Ossicles

Chapter 5 describes each of these pathologies in detail. In this chapter it will be shown that there is a trend relating to benign pathologies among the Kallithea Laganidia sample.

There were two instances of developmental anomalies and defects neither of which indicate social status within the sample or pathologically. Tomb XVI, Burial E's mandible has a solitary developmental cist known as a Stafne defect, which occurs more often in males than females (Barnes 1994). Burial E is an adult male [Figure 7.17].

Burial $\Sigma\tau$ of Tomb XX exhibits bilateral mandibular hypoplasia. It is a mild case and would be considered as a "type I hemifacial microsomia" (Barnes 1994:162). It should also be noted that the mandibular permanent canines are not yet erupted [Figures 7.18, 7.19]. It is uncertain if the mandibular hypoplasia influenced the failed eruption of the canines.

Burial K of Tomb XVI has a frontal button osteoma which is a benign bone growth most often found on the endocranial surface and on the facial bones (Auferheide & Rodriguez-Martin 1998:375). It appears most often among men around 40-50 years old. Burial K fits this demographic as well [Figure 7.20].

Burial $\Sigma\tau$ of Tomb XVI also has four auxiliary ossicles that create a tripartite Inca bone [Figure 5.4 & 7.21]. These additional cranial bones are a unique epigenetic variation

within Tomb XVI and the other four tombs examined (Hauser & De Stefano 1989:99; Berry and Berry 1967) and). Burial Στ is a male 35 to 50 years of age.



Figure 7.17: Stafne Defect, Tomb XVI, Burial E



Figure 7.18: Bilateral Mandibular Hypoplasia, Tomb XX, Burial Στ

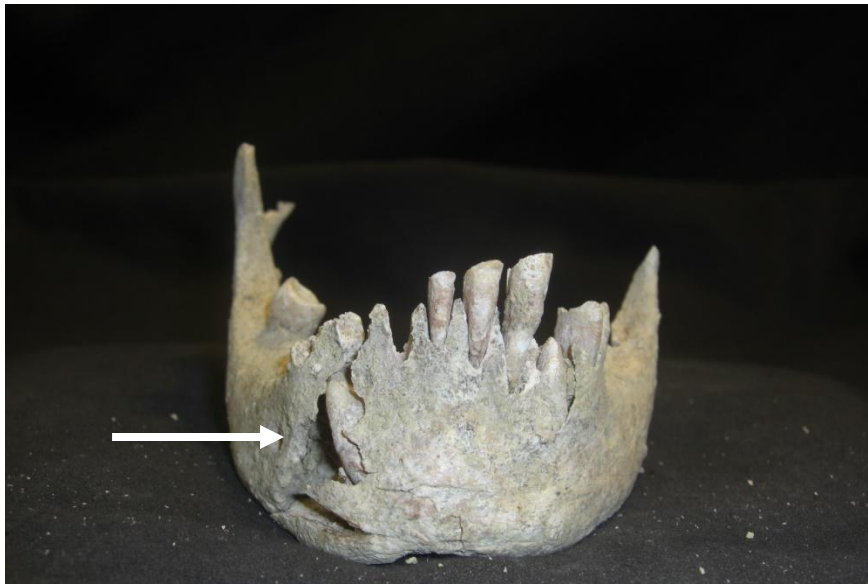


Figure 7.19: Bilateral Mandibular Hypoplasia, Tomb XX, Burial Στ



Figure 7.20: Button Osteoma, Burial XVI, Tomb K



Figure 7.21: Auxiliary Ossicles, Tomb XVI, Burial Στ of XVI

Mycenaean tombs are often considered “family” tombs and Inca bones have been found to be genetic traits within families. Tomb XVI only exhibits a single individual with auxiliary ossicles. With a single occurrence, it is still possible that relatives of Burial Στ were among the other ten individuals of Tomb XVI.

These four of pathologies are completely benign and are not influenced by diet, infection, trauma, or daily activities (Ortner 2003; Aufderheide & Rodriguez-Martin 1998). It is also worth noting that Burials E, Στ, and K are adult male individuals. The data shows that the more insidious and potentially deadly pathologies are more often found among this sample’s females and the benign pathologies are found among males. More women have endocranial infection, inflamed meninges, otitis media, CO and PH, and HFI (mental health

threat). This suggests that the female individuals are putting a greater strain on their bodies and immune system. It also could be related to child bearing. Almost of the women died relatively young and childbirth could have been the cause. A larger sample of the cemetery would have to be taken in order to take this idea any further. For now it is another speculation.

Dental Pathology

The dental health among the five tombs does yield a trend indicating social stratification. Dentition was available for four of the five tombs and thus provides data that are representative of the sample.

Dental health was evaluated by assessing seven dental pathology categories including caries, antemortem tooth loss (AMTL), abscess(es), enamel hypoplasia (EH), periodontal disease (PD), minimal occlusal dental wear (MDW), and severe occlusal dental wear (SDW). Each category was scored according to its presence or absence from individual to individual [Table 7.5]. Shepartz and colleagues (2009) used a similar approach at Pylos to discern social stratification among the dental health data.

Table 7.5: Distribution of Dental Pathologies

Tomb	XV (MNI 15)	XVI (MNI 11)	XVIII (MNI 3)	XIX (MNI 2)	XX (MNI 7)
Dental Pathology	Present among how many Individuals	Present among how many Individuals	Present among how many Individuals	Present among how many Individuals	Present among how many Individuals
Caries	5 (30%)	8(72%)	0	Unknown	>1
Total Caries Per Tomb	20	33	0	Unknown	2
AMTL1	1 (6 %)	5(45%)	Unknown	Unknown	4(57%)
Abscess(es)	2 (13%)	4 (36%)	Unknown	Unknown	Unknown
EH2	--	--	Unknown	--	--
PD3	4 (26%)	4 (36%)	Unknown	Unknown	Unknown
MDW4	4 (26%)	4 (36%)	Unknown	Unknown	Unknown
SDW5	5(33%)	4 (36%)	3 (100%)	Unknown	4 (57%)

¹ AMTL = antemortem tooth loss

² EH = enamel hypoplasia present.

³ PD = periodontal disease present (classified by receding alveolus from dentinoenamel junction)

⁴ MDW = minimal occlusal dental wear (classified by enamel wear without dentin exposure)

⁵ SDW = severe occlusal dental wear (classified by enamel wear with dentin exposure)

⁵ Individuals without assessable dentition: TOMB XV:M, Ξ, K, Θ, O, Z; Tomb XVI: H, K; Tomb XVIII: None; Tomb XIX B; Tomb XX: Δ, Γ, H

Antemortem toothloss and SDW were the most consistent categories among the tombs' individuals and were scored to evaluate the social stratification of the tombs. It should be noted that even though ten adult teeth were collected from Tomb XIX, the preservation was so poor that dental health assessment was not possible. These ten teeth were not included in the data in Table 7.5, as they were not able to contribute toward the data collection.

Evaluating AMTL and SDW, the distribution among adult males and females is without a definitive pattern. Of the available material, there are 6 females and 5 males that have AMTL. Antemortem tooth loss is present in 1 female (6%) of Tomb XV, 6 (45%) individuals of Tomb XVI including 4 males and 2 females, and 4 (57%) individuals of Tomb

XIX including 3 females and 1 male. These percentages increase as the distance of the tomb from the tholos increases.

Severe dental wear is present among 14 individuals, 6 males, 6 female, and 1 indeterminate individual. SDW is present in 5 (33%) individuals of Tomb XV including 2 females, 2 males, and 1 indeterminate, 5(45%) of the individuals of Tomb XVI including 3 males and 1 female, 3 (100%) indeterminate individuals of Tomb XVIII, and 4 individuals of Tomb XX (47%) including 3 females and 1 male. Similar to the increase in percentage seen with antemortem tooth loss, severe dental wear also increases as the tomb's distance increases. This data is visually represented in Table 7.5.

Looking at the dental pathology distribution among males and females, there is little evidence to suggest that one sex had better dental health than the other. The distribution of AMTL and SDW is relatively even which suggests that men and women were eating similar foods according to their social status, and this contrasts with the evidence for differences in infectious disease found between the sexes.

Mycenaeans of the Peloponnese consistently seem to possess high rates of caries and antemortem tooth loss as seen at Pylos (Shepartz et al. 2009:167) and Ayia, Triada (Western Peloponnese) (Tsilivakos et al. 2002). For this sampling, the number of caries among the individuals within a tomb turned out not to be a dental health determinate given the range of available teeth to assess among this sampling of tombs. Moreover, the severity of caries varies. For example, the majority of caries within tomb XVI are non-invasive and small, but this tomb has the most caries among the tombs. The presence or lack of caries within a tomb thus was not able to represent possible social status structure.

Similar to the inconsistency of caries, scoring the presence of periodontal disease was not an adequate gauge of dental health among the tombs. All of the tombs possess loose teeth, alveoli, and mandible fragments that are not able to be identified with any one individual. Moreover the alveolus often suffered post mortem damage and/or no longer held the individual's teeth. Thus the ability to score the presence of PD was inconsistent among the tombs and a similar inconsistency was seen with the presence of abscesses. Neither were depended upon for dental health scoring of social stratification

Enamel hypoplasiae were not used to discern social stratification because none existed that possessed significant measurability. Consistent with Mycenaean at Pylos, Kallithea Laganidia teeth exhibited minimal enamel hypoplasiae (Shepartz et al. 2009:167). This was only representative of this project's sample and there could be better examples of enamel hypoplasia among other tombs at Kallithea Laganidia. For this project's research, this commonly used marker for dental health and social status was not a contributing factor.

Focusing on the AMTL and SDW there is a clear distribution of dental health among the tombs. Table 7.5 highlights these two categories. The percentage of poor dental health increases as the distance from the tholos tomb increases. AMTL increases from 6% in Tomb XV, to 45% in tomb XVI, to 57% in Tomb XX. SDW also increases dramatically from 33% in Tomb XV, to 36% in Tomb XVI, to 100% in Tomb XVIII, and finally to 57% in Tomb XX. It should be noted that antemortem tooth loss was not necessarily related to wear. Thus individuals with minimal wear and tooth loss were victim to severe caries. Overall, these data show that the individuals belonging to tombs closer to the tholos possessed healthier dentition, which suggests a better diet with more protein than sugars.

Understanding ancient diet of the Late Bronze age is a well researched scholarly area (Vermeule 1983; Halstead 1995, Halstead & Isaakidou 2004; Isaakidou et al. 2002; Valamoti 2004; Petrousa & Manolis 2010; Petrousta et al. 2007; Ingvarsson-Sundstrom et al. 2009; Lagia et al. 2007; Triantaphyllou et al. 2008) and dietary isotopic analysis yields the most reliable and clear data. Currently, the only Achaean site that has had isotopic analysis is Voudeni (Petrousa et al. 2004, 2009).

The Mycenaean culture's diet was dynamic due to the population's social structure and trade power (Kardulias 1996). Cultivation was prominent and grain production flourished, including the farming of emmer, wheat, lentil, chick-peas, barley, and tare (Halstead 1995; Petrousa & Manolis 2010: 615). Moreover, Mycenaean sites stored fruits like apples and figs as well as gathered nuts. In addition to the cultivation of grains, olives, and fruits, the Mycenaean were astute animal farmers of pig, goat, cattle sheep, and even deer (Vermeule 1983; Treuil et al. 1996; Halstead & Isaakidou 2004, Petrousa & Manolis 2010: 615). Besides the isotopic evidence of these dietary items, these food groups are also represented on Linear B tablets (Chadwich 1976; Petrousa & Manolis 2010: 615).

The isotopic analysis completed at Late Bronze Age cemetery of Voudeni revealed that these Achaeans consumed a terrestrial mix of plant and animal proteins. The data also revealed that, despite the very close proximity to the sea, little to no marine life was consumed (Petrousa et al. 2009:241). This is a consistent and curious trend among Mycenaean populations (Petrousa & Manolis 2010: 614). At Pylos there was no distinction between sexes or status based on grave goods that was reflected in the isotope analysis (Petrousa et al. 2009:241), this may also be present at Kallithea Laganidia. This terrestrial

diet on mainland Greece has been tested and remains consistent among several different ancient Greek populations over many centuries (Larsen 1997:282).

CHAPTER 8: CONCLUSIONS—MYCENAEAN OCCUPANTS OF ANCIENT KALLITHEA:

Understanding Health, Culture, and Lifestyle Through Bioarchaeological Analysis

This analysis of the human skeletons from five of the Kallithea Laganidia tombs has yielded results that suggest certain trends in the population and offer suggestions for future research. The presence of men, women, and children among secondary burials within these tombs suggested that there is a familial or linear tie within each tomb.

This project confirmed that the status differences seen in the grave goods from the tombs are also reflected in the tombs, based on spatial distribution. The varying quality of burial offerings among the tombs of Kallithea Laganidia suggest that the tombs closer to the tholos contain burials of the socially elite, and the tombs farther away from the tholos contain burials of lower social classes. The pathology data collected, and more specifically the dental pathology data, do reflect social stratification among the sample's five tombs, particularly when looking at antemortem tooth loss and severe dental wear.

In addition, there are indications of status or behaviour differences between the sexes. Kallithean women seem to have been exposed to infection during life more often than men. Women have higher rates of infectious disease, and indications of more antemortem cranial trauma than men. This could have been worsened by female responsibilities such as bearing a child or breast feeding. As suggested before, due to the Mycenaean women's role in the burial ritual they could have been exposed to harmful pathogens more often than men, and differences in diet may also have contributed to higher disease rates. The presence of higher rates of cranial trauma suggests that the women may have suffered domestic violence.

Not all women, however, were in poor health or suffered abuse. Burial M seems to be an elite woman that had very healthy dentition, was in Tomb XV close to the tholos, and exhibited the bilateral enthesopathies which may have been caused by horseback riding. These characteristics place Burial M into high social class and she was buried in a tomb that reflected this.

Moreover, Tomb XIX has a story that neither skeletal nor dental pathology can tell. Without the osteological analysis this tomb would have been considered somewhat barren and not intriguing. The presence of fetal remains in association with a woman's skeleton is a reminder of the dangers of pregnancy and childbirth in antiquity. This tomb also exemplifies how important collaboration is between the archaeologist and physical anthropologist

The Future For Kallithea

As mentioned previously, due to the small sample size there was little statistical analysis carried out for this project. An interesting study would be a comparison of cranial morphology and genetic trends at Kallithea with foreign populations with whom this Mycenaean population would have had contact. The Achaean area had much foreign contact due to its maritime trade. Thus, there is potential for non-mainland Greece populations to possess similar traits found at Kallithea Laganidia. Sources of potential contact include, but are not limited to, the ancient populations of Italy, Egypt, Turkey, the Balkans, Macedonia, and the Levant. An investigation of clustering of familial traits among tombs could also be useful in addition to the aforementioned broad comparisons, because no such analyses have been completed for any Achaean cemetery.

Examining social stratification not only within the cemetery as a whole but also within the tombs would be another interesting approach for the future. The evidence of a change in social status over the period of use within Tomb XV suggests that a more detailed examination of variation within tombs would be useful. Alternatively, it is possible that individuals from more than one lineage are buried within a particular tomb. Just as the smaller communities copied the mortuary trends of the palace centers in order to appear equally prestigious, individuals of lower social class could be buried in tombs with higher class individuals. By doing so, the lower class individual's family would gain higher social standing within the community solely based on the physical proximity of the socially elite with the lower class family member.

The Kallithea Laganidia cemetery has the potential to yield new and informative data about the Achaean Mycenaean population. From this small sampling of 38 burials from five tombs, already the demography and paleopathology of this peripheral group is beginning to be deciphered. Future work should add to our understanding of the Mycenaean world and the people who lived in it.

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APPENDIX A: PHASING

Chronological Phasing

The cemetery of Kallithea Laganidia was in use from LHIIIA to LHIIIC. This dates to the Early Mycenaean Period when palaces came to dominate the Bronze Age communities on mainland Greece (Wright 2008:231). The chronological pottery sequence of Kallithea Laganidia is based on the phases for the Krini primary burials (Paschalidis & McGeorge 2006: 5). The archaeological material is currently being fully catalogued by Evy Papadopoulou-Chrysiopoulou for her dissertation, so full descriptions are not yet available. The dates for each burial were assigned using the pottery chronology which was kindly provided by the excavators Thanasis Papadopoulou and his daughter Evy Papadopoulou-Chrysiopoulou. One of the primary interests of the archaeologists was the chronological sequence of the burials and the biological information about each individual associated with various grave goods, and this information is provided here. It is recognized that the burial sequences will probably be of little importance for this small sample size, but may become significant when the analysis of the entire cemetery is completed.

Phase I: LHIIIA1-LHIIIA2 Transitional Early Mycenaean Period

At Kallithea Laganidia this period is represented by nine secondary burials (Γ through I) all found within the northern part of Tomb XVI's chamber. Among the secondary deposits of bone piled on the edges of the tomb there were several burial offerings including 2 handleless jars, 4 alabastra, 1 handleless conical cup, 1 globular jug, 1 bronze leaf-shaped spearhead, 1 bronze one-edged knife, 2 buttons, and beads. Due to the commingled nature of

the remains it is impossible to definitively associate the burial goods with any single individual.

Phase I is represented by a juvenile female under the age of 20, three adult males and two adult females ranging from 20 to 35 years old, and two adult male and a single female aging from 35-50 years old.

Phase II: LHIIIA2 Early Mycenaean Period

Unlike Laganidia's Phase I, Phase II is solely represented by primary burials from Tombs XV and XVI. Seven individuals represent this period: Burials B, Γ, Λ, M, and N from Tomb XV and Burials A and B from XVI. Of these primary burials, two possessed no associated or identifiable offerings, four had a single three handled round alabastron, and Burial M had an elaborate necklace of faience, bronze, and semi precious beads.

Within Tomb XV, Burials N and M are contemporaneous. Burial Γ was placed inside XV prior to Burial B. Tomb XVI's Burials A and B are contemporaneous with each other. Even though the pottery dates these burials to the same phase, the order in which they were placed in the tomb is significant.

Phase II is represented by a male individual ranging from 20-35 years old, one male 35-50 years old, one female at least 40 years old, one female 29-39 years old, and three females 20-35 years old. These burials will be discussed in greater detail later in this chapter.

Phase III: LHBIIB1-LHIIIC Early Transition and Development Period

There are both secondary and primary burials of this period, dating specifically to LHIIIA2/IIIB1 to LHIIIC. There are a total of seven primary and eleven secondary burials from Tombs XV, XVIII, and XX. Eight burials of this phase are from Tomb XV and are all secondary. The associated artifacts include 3 three-handled round alabastra, 1 base of a black-painted deep bowl, 1 four-sided seal stone, 1 bronze bead, a number non-bronze of beads, and 4 buttons. Burials XV Δ, E, Z, H, Θ, I, K, Ξ include two females and two males aged 20-35 years, one female aged 35-50 years, one subadult of unknown sex approximately 6 years old, one infant of unknown sex, 9 months to 1 year old, and finally one infant.

Three of Phase III's primary burials belong to Tomb XVIII. These individuals, Burial A, B, and Γ, were all in poor condition and thus sex and estimated age were not able to be determined. Despite the poor preservation it was clear that these three were adults. Burial A had many offerings including 1 globular jug, 2 stirrup-jars, 1 round alabastron, 1 piriform jar, 1 triple composite vessel, and a small fragment of worked quartz-like material. It is unclear which items belong to B or Γ, but one lentoid steatite seal stone and 2 steatite buttons were uncovered in the same soil layer. Moreover, Burials B and Γ are not only contemporaneous but also older than Burial A.

Four primary and three secondary burials of Phase III are from Tomb XX. The primary burials A, B, Γ, and ΣT represent one female 35-50 years old, one female 20-35 years old, 1 adult of indeterminate age and sex, and one male 35-50 years old. Three three-handled alabastron and a single askos were among these burials. Burial ΣT is the oldest burial in Tomb XX. Three of Phase III's secondary burials are also from Tomb XX. Burials Δ, E, and H represent two females, one 20-35 and the other 35-50 years old, and a prenatal fetus

represented by a single left rib. A single stirrup-jar and one clay button were found among the commingled remains.

Phase IV: Unknown Mycenaean Time Period, Possibly Era of Disuse

Tomb XV's dromos at the chamber entrance had a shallow pit grave between the two xiolithia. Burials A and O were in such poor condition that all that could be determined was that originally two adults' remains were placed in this spot, one of which was a primary burial. From the dental wear it could be suggested that Burial A is an older individual, possibly 35-50 year old.

Phase Unknown: Chronology Unclear

Tomb XIX is not able to be phased with the rest of the sample based on the ceramic dating. The excavator has dated the XIX pottery at LHIIIA2-LHIIIC. Thus tomb XIX spans Phases I-III. Due to this, XIX was excluded from a chronological phase and instead was designated as unknown.

APPENDIX B: RAW DATA

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XV	A	Primary	SE-NW	Dromos	IND	Adult	IND	DW	None	Unknown
XV	O	Primary	Unknown	Dromos	IND	Adult	IND	IND	None	Unknown
XV	B	Primary	SE-NW	Soil Layer 1	F	Adult, 35-50	Perimortem meningeal infection	AMTL, DW	3-handled round alab.	LHIIIA2 (ceramic)
XV	Г	Primary	SE-NW	Soil Layer 2	M	Adult, 35-50	Perimortem infection of tibia and cranium	Ab, AMTL	None	LHIIIA2-LHIIIB2 (strat.)
XV	Δ	Secondary	E wall of chamber	Soil Layer 2	F	Adult, 20-35	Perimortem maxillary infection	DW, AAI	Several	LHII-III B2 (ceramic)
XV	E	Secondary	E wall of chamber	Soil Layer 2	M?	Adult, 20-35	Perimortem maxillary	DW, AAI	Several	LHII-III B2 (ceramic)

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
							infection			
XV	Z	Secondary	E wall of chamber	Soil Layer 2	F	Adult, 35-50	Healed cranial depression fracture , HFI	IND	Several	LHII-III B2 (ceramic)
XV	H	Secondary	E wall of chamber	Soil Layer 2	IND	Subadult, 6 yrs +/- 24 mos.	None	DW	Several	LHII-III B2 (ceramic)
XV	Θ	Secondary	E wall of chamber	Soil Layer 2	M	Adult, 20-35	None	IND	Several	LHII-III B2 (ceramic)
XV	I	Secondary	E wall of chamber	Soil Layer 2	IND	Subadult, 9mos. -1yr	None	IND	Several	LHII-III B2 (ceramic)
XV	K	Secondary	E wall of chamber	Soil Layer 2	F	Adult, 20-35	Perimortem cranial	IND	Several	LHII-III B2

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
							depression fracture and infection			(ceramic)
XV	II	Secondary	E wall of chamber	Soil Layer 2	IND	Neonatal, >9mos.	None	IND	Several	LHII-III B2 (ceramic)
XV	Λ	Primary	E-W	Soil Layer 3	F	Adult, 20-35	Almost fully healed depression fracture	DW	1 body and 1 handle sherd	LHIIIA2 (ceramic)
XV	M	Primary	E-W	Soild Layer 3	F	Adult, 20-35	Lateral femoral enthesopathies	DW	1 necklace of faience and semiprecio us beads	LHIIIA2 (ceramic)

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XV	N	Primary	NW-SE	Soil Layer 3	F	Adult 20-35	Healed traces of anemia	DW	1 3-handled alab.	LHIIIA2 (ceramic)

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XVI	A	Primary	SE-NW	Soil Layer 1	F	Adult, 35-50	HFI and healed hematoma	DW	1 3-handled alab.	LHIIIA2
XVI	B	Primary	SE-NW	Soil Layer 1	M	Adult, 20-35	None	DW, AMTL	None	LHIIIA2
XVI	Γ	Secondary	N part of chamber	Soil Layer 1	F	Adult, 20-35	None	DW	Several	LHIIIA1- IIIA2

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XVI	Δ	Secondary	N part of chamber	Soil Layer 1	M	Adult, 20-35	None	AMTL, Ab	Several	LHIIIA1-III A2
XVI	E	Secondary	N part of chamber	Soil Layer 1	M	Adult, 20-35	Stafne's defect, healed cranial depression fracture	DW	Several	LHIIIA1-III A2
XVI	ΣT	Secondary	N part of chamber	Soil Layer 1	M	Adult, 35-50	None	DW	Several	LHIIIA1-III A2
XVI	Z	Secondary	N part of chamber	Soil Layer 1	F	Adult, 20-35	None	IND	Several	LHIIIA1-III A2
XVI	H	Secondary	N part of chamber	Soil Layer 1	M	Adult, 35-50	None	DW	Several	LHIIIA1-III A2

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XVI	Θ	Secondary	N part of chamber	Soil Layer 1	F	Adult, 35-50	None	DW	Several	LHIIIA1- IIIA2
XVI	I	Secondary	N part of chamber	Soil Layer 1	F	Adult, 20-35	None	DW	Several	LHIIIA1- IIIA2
XVI	K	Secondary	N part of chamber	Soil Layer 1	M	Adult, 35-50	Button Osteoma on Frontal	IND	Several	LHIIIA1- IIIA2

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XVIII	A	Primary	SW-NE	Soil Layer 1	IND	Adult	IND	DW	Several	LH IIIB2/IIIC

XVIII	B	Primary	NW-SE	Soil Layer 2	IND	Adult	None	DW	Several	UNKNOW N
XVIII	Γ	Unknown	Unknown	Soil Layer 2	IND	Adult	IND	DW	None	UNKNOW N-likely same as Burial B

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
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XIX	A	Secondary	E part of chamber	Soil Layer 1	F?	Adult, 20-35?	IND	IND	6 stirrup-jars, 1 juglet, 1 high-stemmed amphoriskos, 1 bronze and 1 gold ring.	LH IIIA2/IIC
XIX	B	Primary	E part of chamber-excavated with A	Soil Layer 1	IND	Neonatal/Fetus, Mid-fetal 5 mos.	None	IND	Maybe the 1 high-stemmed amphoriskos	LH IIIA2/IIC

Tomb	Burial #	Burial Type	Burial Orientation	Location/ Context	Sex	Age Estimation (in years)	Prominent Pathology	Dental Health	Burial Offerings Present?	Dating
XX	A	Primary	NW-SE	Soil Layer 1	F	Adult, 35-50	None	AMTL, DW	1 askos and 1 3-handled alab.	LH IIIA2/B1
XX	B	Primary	NW-SE	Soil Layer 2	F	Adult, 20-35	None	AMTL, DW	1 3-handled alab.	LH IIIB1
XX	Γ	Primary	NW-SE	Soil Layer 2	IND	Adult	IND	IND	None	LH IIIB1

XX	Δ	Secondary	SE portion of the chamber	Soil Layer 2	F	Adult, 20-35	None	IND	1 stirrup- jar and 1 clay button.	LH IIIB1
XX	E	Secondary	SE portion of the chamber	Soil Layer 2	F	Adult, 35-50	None	AMTL, SDW	(Shared with Δ)	LH IIIB1
XX	H	Secondary	SE portion of the chamber	Soil Layer 2	IND	Fetal	None	IND	None	LH IIIB1
XX	ΣT	Primary	SE-NW	Soil Layer 3	M	Adult, 35-50	Mandibular Hypoplasia and bilateral impacted mandibular canines	AMTL, DW	1 three- handled alabastron	LH IIIB1