The Fixed and The Fluid:
Understanding Social Identity through Cranial Modification

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Dedication

To my sweet babies

Olivia, Joey, Brayden and Raleigh

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This thesis, while ultimately my own endeavor, could not have been possible without the support of so many along the way. My Advisor, Eric Cline, who supported me with words of encouragement and kindness throughout my undergraduate career, Jeffery Blomster who mentored me throughout my graduate career, and in whose class my interest in cranial modification began. I would also like to acknowledge David Hunt at the Smithsonian Institution who made it possible for me to collect the data needed for this thesis.

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CHAPTER 1: Introduction

Introduction

The practice of cranial modification has been a source of interest to anthropologists and archaeologists alike, as the skeletal remains of these ancient populations can help tell their story. Cranial modification is the intentional practice of modifying the skull using methods such as boards, pads, bandages, or simply using hands. The human skeleton has the potential to provide the information that archaeologists need in order to reconstruct the past by providing bioarchaeological information on prehistoric population movement, as well as cognitive abilities and influence on social hierarchies. The practice of cranial modification has been carried out across the world for many different reasons, ranging from the belief that it was a sign of beauty to the belief that it connected one with the gods.

Figure. 1.1 The Maize god as a scribe. Source The Maya Book of the Dead, The Ceramic Codex. University of Virginia (1981). This particular work is significant because it demonstrates the modified crania that were distinctive of the Maize God.

Cranial modification and body modification has extended throughout human history, as well as around the world, throughout many different cultures. According to archaeologist Juan R. Munizaga, the practice of artificial cranial modification appeared simultaneously in Ecuador

and in an area reaching from Mexico to the coast of Peru around 4000 years ago (Munizaga 1976). From Australia to the steppes of Eurasia, there have been many different types of body modification, regardless of their form. These body transformations carry social meaning, and many are associated with changes in status. For example, in the Pacific Northwest women used a labret to indicate social status (Cybulski 1974, Moss 1999). While the modification-a skin incision- required to wear the labret would be lost archaeologically the abrasions left on the teeth would remain as a permanent mark on the human skeleton (Cybulski 1974). However, the device was removable, as was the status that it signified, eventually leaving only the traces of the former status. (Cahue et al. 1998). These 'marks' can easily be read by those within that society, and were integral to the social identity of the individuals within that group.

Unlike the labret mentioned above, the act of modifying crania was a permanent status symbol. Many symbols can be permanently added to the body, such as tattooing or scarification, however very few of these would appear in the archaeological record. Therefore, it is to cranial modification that many archaeologists look when trying to understand the social complexities of past cultures. Permanent alterations to the body are, therefore, intrinsically bound up with meaning, at both group and individual levels. Archaeologist Rosemary Joyce (2005) remarks on body modification symbolism in her work, *Archaeology of the Body*, she explains how the body becomes a signifier within the society due to continuous public display. Joyce remarks that there are cultural practices which often leave evidence on the physical self, such as tattooing, piercing, cranial modification. This, she says, is how "the biological person is both the medium and product of social action." (Joyce 2005:142).

What is Cranial Modification?

To have a clear understanding of cranial modification, it is necessary to understand the cranial bones that are most affected by the modification process. The cranium is comprised of 22 bones, but for the purpose of this thesis and the understanding of cranial modification, only four of these bones will be included in the discussion throughout, the frontal, occipital and two parietals.

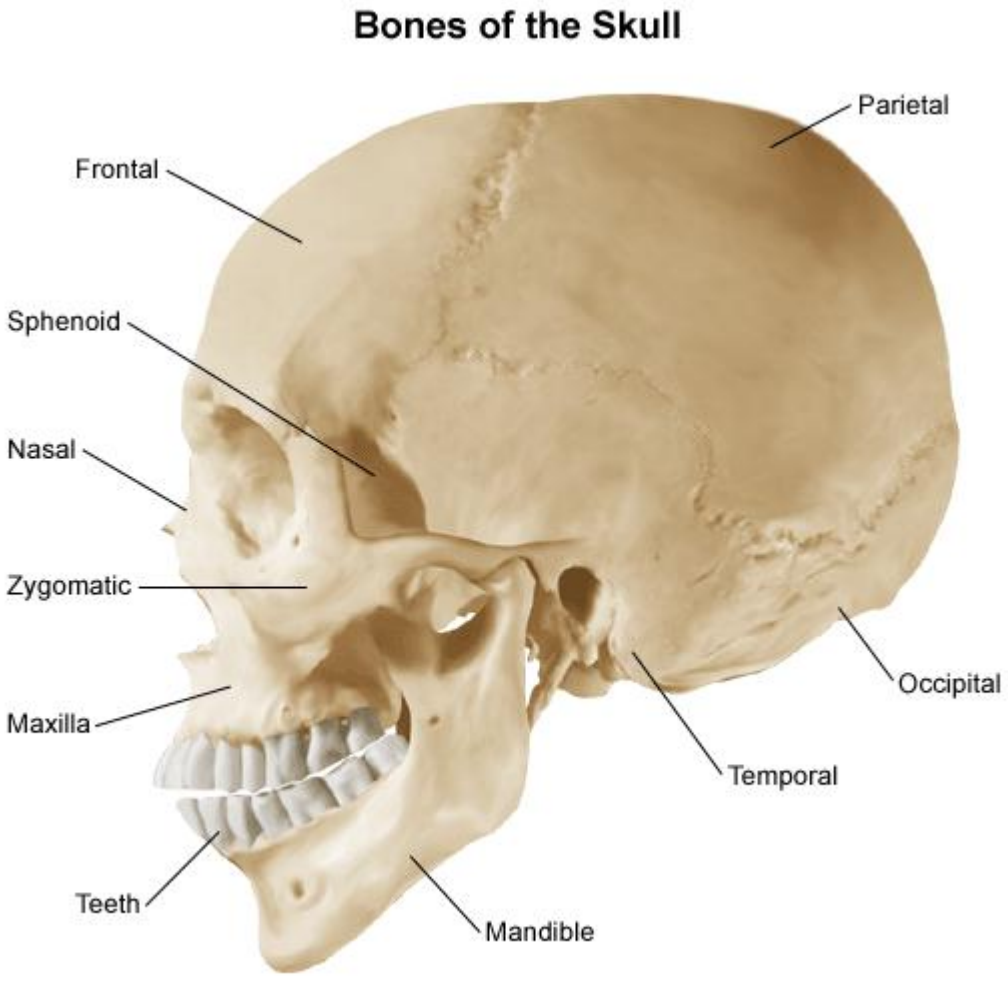


Figure 1.2 Bones of the cranium. So*urce: Yalemedicalgroup. Org.*

There is a continuum between the cranial modification that occurs as an unintentional result of swaddling practices and the intentional binding of the head for social reasons

(Eeckhout 2013). Both create a modified head shape, and both carry some social significance. Cradle boarding generally results in a slight to moderate flattening of the occipital, with some asymmetry. Deliberate head shaping often involves more than one of the cranial bones, as well as pressure from multiple directions, ultimately producing head shapes that can deviate in sometimes radical ways from natural forms.

The use of a signifier like cranial modification, also suggests a level of social stability that applies an identity marker at birth, with the intention for that social identity to be fixed throughout the individual's lifetime. Cranial modification in infancy becomes a fundamental part of a person's identity, whether social or ethnic. Since this alteration must be performed in infancy, it serves as an ascribed symbol of group identity, not a sign of earned status.

According to Moss, artificial cranial modification can be defined as "the dynamic distortion of the normal vectors of infantile neurocranial growth through the agency of externally applied forces" (Moss, 1958:275). Many different types of cranial modification have been classified based on archaeological evidence, as well as ethnographic reports. The most common forms of cranial modification include "…those that are antero-posteriorly…constricted by boards, stones, or pads but allowed to grow laterally and superiorly" (Antón and Weinstien, 1997:196).

The Bioarchaeological Approach

Bioarchaeologists use human skeletal remains to address questions about human behavior in the past through integration of biological data with archaeological evidence (Buikstra 1977). Body modifications, such as tattooing and scarification are impossible for bioarchaeologists to examine when only skeletal remains are available. Additionally, through the study of skeletal remains, much information about an individual can be revealed. For example,

bioarchaeologists can examine skeletal remains to help determine an individual's age. This can be done using aspects of skeletal growth through epiphyseal fusion rates, as well as dental wear and eruption.

Through skeletal analysis, bioarchaeologists are able to make a determination of sex, if the skeleton is sufficiently mature and enough of the remains are present. Though skeletal analysis is not an error- proof system, enough indicators are usually present for an analysis to be made. To determine the sex of skeletal remains, bioarchaeologists can perform a general examination of the crania. Males have a tendency toward larger brow ridges, nuchal crests, and mastoid processes. Also, males are generally more robust overall, whereas females are more gracile, have smaller cranial features, and typically have a broader pelvis with a wider angle between the two inferior pubic rami (Ubelaker 1989, White and Folkens 2000)

In addition, bioarchaeology allows determinations regarding the health of an individual. There are several pathological conditions that can be indicated through cranial remains. Diet and dental health can be analyzed through the teeth, and many stress and activity indicators can be presented in the skeletal remains. Repetitive activities often leave a markers on bone surface, such as differential arthritis. Stress can lead to poor health, and this may also leave indicators on bone. Porotic hyperostosis, causing alteration to the cortical bone tissues. This disease, is frequently used as an indicator of nutritional and metabolic stress reflected in burial populations. (Ubelaker 1989, White and Folkens 2000)

The Present Research

In my thesis, I will focus on the social and geographic differences between the Maya of Mesoamerica and the Pre-Columbian Andean societies of coastal Peru. The research is based

upon data collected from the skeletal remains of over 1600 individuals from pre-Columbian sites.

I contend that the practice of cranial modification among the Maya was a symbol of ethnicity due to its ubiquity and appearance across class lines within communities. In contrast, cranial modification along the coast of Peru does not appear to have marked class or ethnicity, as it does not appear consistently among a community or population at any one site or region. In order to asses this hypothesis, information was gathered from past cultures that practiced cranial modification and studied via a literature search and review the various types of cranial modification. Analysis of actual crania was performed using the collections housed at the Smithsonian's Natural History Museum in Washington, D.C..

Structure of Thesis

The second chapter will review cranial modification as it appears in anthropological literature, discuss reasons why people chose to alter head shape, and the history of this form of research. The third chapter will turn to theoretical considerations and some of the research issues that have risen in the past, as well as within this paper. In Chapter Four, the sample that was used in this thesis will be discussed, along with a short historical background for both the Maya and Andean cultures that are analyzed. In Chapter Five, the bioarchaeological methods will be discussed. This will include the way the sample for this project was chosen, and the classification of head shape. Chapter Six will discuss the results from the analysis; this will look closely at the indicators that were examined. Chapter Seven will be an analysis of two sites chosen as case studies for this thesis. It will include an in-depth look at Pachacamac in the Andean region, and Blue Creek in the Maya area. Finally, Chapter Eight concludes with a comparison of the overall analysis and findings.

CHAPTER 2: Cranial Modification in Anthropological Literature

Introduction

The intentional alteration of the shape of the crania by artificial means was a widespread custom during both ancient and modern times, and was employed by different cultures around the world (Antón and Weinstein 1997; Brown 1981). Although cranial modification has been seen throughout the world, the consistency and homogeneity in cranial modification appears to be culturally specific. There are many populations where evidence of cranial modification appears to be unintentional; most likely as a result of cradleboarding, or swaddling (Brian 1979:90).

Why do People Alter Head Shape?

The body is central to anthropology, in that the body is the vehicle through which we present ourselves to others (Albin 2006; Ferraro 2001). Given its permanence and visibility, cranial modification mainly served to 1) differentiate between groups 2)withstand time 3) be a strong indication of the underlying social structure, 4) identify oneself as a member within a particular social or ethnic group. Cranial modification can create a social boundary that could provide a specific population with a social or economic advantage. As previously described, alterations and adornments of the human form can be a strong signifier conveying membership (Meskell 1998:140) To this end, cultures around the world have employed many forms of cranial modification in order to transmit ideas such as status, gender, group identity, and attractiveness (Albin 2006; Montserrat 1998).

There are historical accounts where cranial modification was practiced as a way of imitating a group of conquerors. The earliest written record comes from ancient Greek philosopher Hippocrates, 400 BCE, when he writes of the Macrocepahes people who were called

so because of their practice of cranial modification (Lekovic 2007) The Macrocephali were a tribe from Africa that practiced this body alteration. They were mentioned in Greek works because the Greeks found this practice unusual. However, there were other conquering groups who also practiced cranial modification. According to Bachrach (1973) one such group were the Huns from Asia. By CE 300, the East Germanic tribes under the rule of the Huns had adapted this practice as well.

Intentional cranial modification can also serve to make internal boundaries within a population. There were populations in North, South and Central America which participated in the practice of cranial modification. These populations included the Pueblo Indians, the Olmec, Aztec and Maya (Schijman, 2005:946), as well as other cultures throughout South America, including the cultures of the Andes. Although, these populations all practiced cranial modification both the role of the modification, and the variation, may have differed drastically between the cultures. While two societies may have practiced a fronto-Occipital form of modification, the purpose for one may have been to indicate a priestly class, whereas with the other it may have been a simple signal that they were a member of that particular society. Societies may have even applied restrictions on who would be allowed to modify their crania.

However, one of the most fascinating aspects of cranial modification, in terms of social organization, was those employed by the American Indian group of the Chinook. The Chinook would forbid their slaves from practicing cranial modification on their own children, thereby prohibiting them from advancement within the community (Irving and Todd, 1964:88). This is an example of how cranial modification is an indicator of an ascribed status, the social status of a person being assigned either at birth or involuntarily later in life. It is a position that is neither earned nor chosen, but assigned.

A History of Research on Cranial Modification

Cranial modification has long been a focus of research for anthropologists, archaeologists, and even physicians. Anthropologists have long viewed cranial modification as a cultural feature that serves to mark territory or social boundaries, emphasize ethnic differences, reinforce exchange networks, among some of the common interpretations (Gerszten 1993:87).

During his research on connections between *H.erectus* and early Australians, bioarchaeologist Brown (1981) discovered that there would be difficulty in accurately making those connections due to cranial modification present in the skulls, distorting what would have been possible diagnostic characteristics. Brown (1981) noted that one of the most recognizable effects of cranial modification is increased cranial height. Brown noted several markers that indicated cranial modification. The first of these were a long and flat frontal bone, second was great basion-bregma height, third, a long and flat occipital with a low occipital curvature index, fourth, a high parietal curvature index, and finally, greater variance in the parietal curvature index. Taking these markers into consideration, Brown concluded during his research of Pleistocene crania, that "several of the crania from CooBool, Kow Swamp and Cohuna are artificially deformed" (Brown 1981:165). While he does not, however, have direct ethnographic evidence of cranial modification for these populations, there are ethnohistories describing the act of artificial cranial modification practiced in other Australian populations. From the islands of Torres Strait Miklouho –Maclay (1880) and Yhaddon (1912), records have identified the practice of cranial modification by head pressing. According to Brown (1981), these practices would "produce a more subtle and variable [modification] of the vault than head binding and this was probably the method employed on the [modified] Coobool and Kow Swamp crania" (Brown 1981:165).

Antón and Weinstein examined Brown's work and reviewed his findings. Using measurements on vault contours, frontals, parietals, occipitals, and non-metric traits, they were able to determine that at least some of the crania had been artificially modified. They confirmed that the use of vault and facial characteristics to connect *H. erectus* and early Australians would be problematic. They argued that "…study further suggests that at least some of the cranial characters used to link *H. erectus* and early Australian *H. sapiens* are inappropriate due to the presence of artificial [modification]" (Antón and Weinstein 1997:207)

An additional examination of these crania was undertaken by Durband in 2007. His findings supported the previous two projects with these samples. Durband looked specifically at the Coobool Creek sample, and he found that there was evidence of artificial cranial modification, especially with the effects on the frontals. In his conclusion, Durband (2008) states that his findings support the previous research conducted on these samples; "with three separate projects using entirely different methods arriving at very similar conclusions, it would seem to be increasingly difficult to argue that cultural modification of the skull did not take place in Pleistocene Australia despite the lack of more recent ethnographic evidence of this practice" (Durband 2007:812).

Cognitive Effects in Literature

With cranial modification being practiced around the world, a question arises about whether these alterations affect the brain in a cognitive manner. In the past it was believed that an increase in cranial capacity was the equivalent of greater intelligence (Lekovic et al. 2007). While research has concluded that this is not necessarily true for humans, it is known that the shape and size of the crania does affect the actual size of the brain; "Volume of the brain

container is affected by shape as well as size, [and] maximum volume occurs with a sphere" (Beals et al. 1984:305).

So, what then of artificially modified crania? Beals et al. (1984) states that "the volume of the brain container is obviously a function of its dimensions. Increasing vault height and breadth relative to length thus increases capacity" (Beals et al. 1984:306). From this statement it would seem that artificially modified crania would not affect the brain, nor its capacity to function properly. Research conducted by Beals et al. (1984) suggests that despite the shape of the crania, the brain will compensate and adapt. Their research indicated that the size and shape are virtually identical; they increase together, decrease with nasal index and are only weakly associated with stature. "During the general course of hominid evolution the cranium tends to simultaneously toward both larger size and rounder shape. Even if the size remains the same, volume increases as the ratio of length to breadth decreases"(Beals et at. 1984:309).

Weber et al. (2008) came to the conclusion that cranial modification does not have a profound effect on cognitive abilities. Historically, it would be impossible to know if practicing cranial modification in populations would have an effect on cognitive abilities. However, Lekovic et al. (2007) investigated this issue in their research, choosing to look at the artificial cranial modification as it was practiced in the New World, and how that would compare with modern concerns regarding cranial modification in infants today.

In order to perform a more in depth study of the issue surrounding unintentional cranial modification in modern infants, Lekovic et al.(2007), and others looked back at the pre-Hispanic populations of the Americas. "Presumably, adverse effects of head shaping among the literate elite would have been obvious to others, as cognitive impairment would have hampered reading and writing abilities" (Lekovic et at. 2007:1140). There is evidence that cranial modification

practices remained consistent during the Preclassic and Postclassic periods (100BCE –CE 1521). However, this was during the same period in which the Maya continued a stable progression of arts and sciences. Therefore it would be reasonable to assume that within these populations, where modification was so wide spread, any changes or effects on cognitive abilities would have brought modification practices to a halt.

In their analysis, Lekovic et al.(2007) found that "physical research of the neurocranial vault results in a series of compensatory bony changes required for normal neural growth so that the size of the neurocranial vault remains the same" (Lekovic et al. 2007:1141). Therefore, no effect on the brain should be seen. Furthermore, Dingwall stated in his research, "It does not see that the practice of head [modification] among the North West Coast tribes [of North America] affects their mental faculties" (Dingwall 1931).

The 1930's produced two original works on cranial modification. These are Eric J. Dingwall's 1931 monograph *Artificial Cranial Deformation: A Contribution to the Study of Ethnic Mutilations* and Adolfo Dembo and José Imbelloni's *Deformacions Intencionales del Cuerpo Humano de Carácter Étnico* (1938), which devoted seven chapters to cranial modification. According to Hoshower et al. (1995), the most widely accepted categorization of cranial modification was that which was produced by Dembo and Imbelloni. They modified previous categorization, looking at both the shape of the skull and the device which was used to make the modification. Christine White describes Dembo and Imbelloni's tabular-oblique style by saying that it is "characterized by flattening of the frontal and occipital bones, a bulge anterior to a depression along the axis of the coronal suture, lateral bulging of the parietals, and frequent depression along the sagittal suture, which together create a bilobal effect in superior or posterior views" (White 1996:400). According to White, the most strongly area affected by

this type of artificial modification is the parietal area, and that during the process, the parietals may have been "subjected to the most extreme tensile forces during their peak growth" (White 1996:407). Other categories developed by Dembo and Imbelloni are the fronto-occipital erect modification and the adaptation of Hrdlička's circumferential type (Hoshower et al. 1995:149)

Tabular Erect

Tabular implies the skull is subject to fronto-occipital compression. For the skull to then be classified as erect, the pressure must have been applied to the upper-squamous region of the occipital. Tabular erect modifications display an angle of less than 120 degrees, formed by the oblique, or general, cranial axis and the Frankfort plane. The flattening produced is in such a posterior plane that the angle formed with the basion-bregma line is so acute that the two planes are almost parallel. The pressure in the tabular erect modification involves all three of the bones in the lamboid area - the parietals and the occipital - and is applied in a "cradle position" (Comas 1960:391). (Figure 2.1) Dembo and Imbelloni (1938) further describe seven variations within the tabular erect type of modification. However, as there were no crania analyzed that displayed these types of variation; they will not be discussed here.

Figure 2.1 Tabular Erect modification type as seen at Pachacamac. Smithsonian Collections. *Photo:J.Han*

Tabular Oblique

The oblique designation within the tabular category is used when the pressure to the crania was placed on the entire occipital area. The cranial axis forms an angle with the Frankfort plane of about 120 degrees. The pressure involves only the occipital bone (Figure 2.1). Five variations are discussed within the tabular oblique type of modification, but as they are not used in my study, they will not be presented here.

Figure 2.2 Tabular Oblique cranial modification as seen at Pachacamac Peru. Smithsonian Collections. Photo: J.Han

Orbicular/Annular

In the orbicular head shape, the cranium appears to have been shaped by elastic bands or bandages that compress the entire circumference of the crania. The normal cross-section of a skull in the orbicular category along the cranial axis is almost circular, whereas in a tabular, this

same section is flattened in an antero-posterior direction. The angle formed by the Frankfort plane and the foramen magnum is almost always negative. Skulls of the erect variety with hypsicephely, or a high head (Bass 1995), or the obliques with platycephaly, or a broad head (Dorlands Medical Dictionary 2009) may be classified as orbicular. Thus, there are four overall categories within Dembo and Imbelloni's (1938) classification of cranial modification: tabular erect; tabular oblique; orbicular erect; and orbicular oblique (Comas 1960). In the orbicular classification, there are only two variations of both the erect and oblique variety. One variety of the conical, in which the anterior-posterior diameter is greater than the transverse diameter and the skull, takes on the shape of a cone. The second variety is cylindrical, described as the curves perpendicular to the shape's general axis are significantly circular and the skull takes on a cylindrical shape.

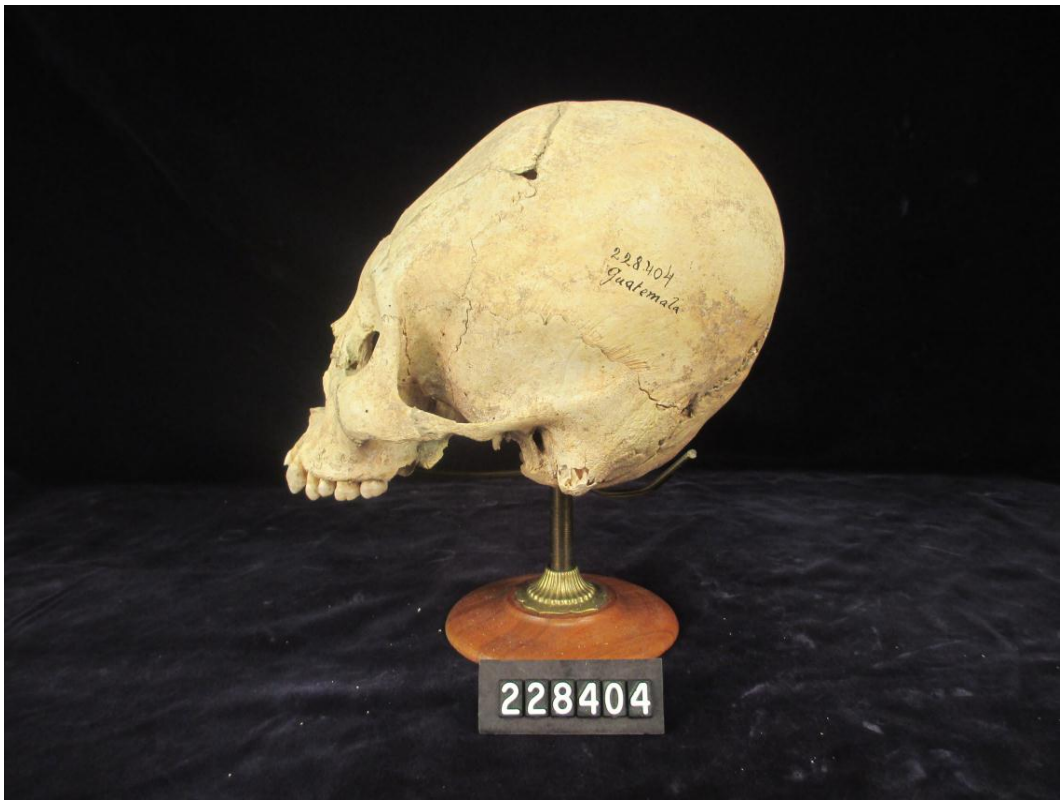


Figure 2.3 Orbicular /Annular cranial modification. Smithsonian Collections. *Photo: J.Han*

The decades of cranial modification study by physical anthropologists subsequently, produced many different schemes for classifying cranial modification. Being that Dembo and Imbelloni's (1938) classification system remains the primary typology used in the study of cranial modification, it will be employed throughout this thesis.

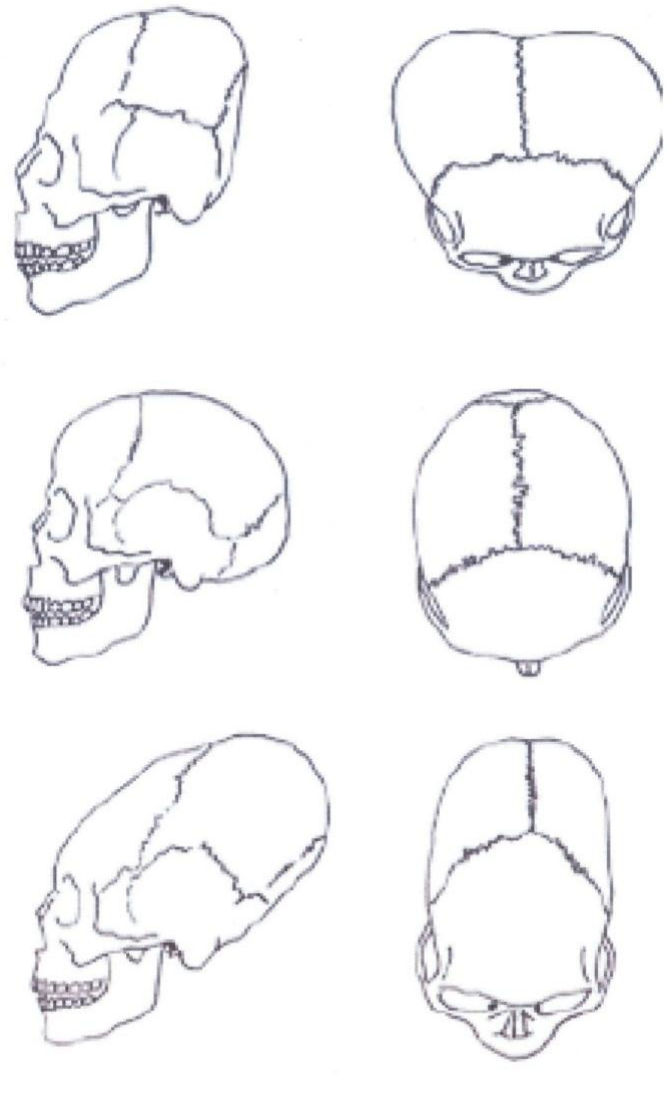


Figure 2.4 Different variation of cranial modification. Top row depicts tabular type of variation, the middle row is unmodified crania, and the bottom row depicts annular type of modification. *Source: after Dembo and Imbelloni (1938)*

Analysis of Physical Attributes

During the 20th century, physical anthropologists came to be interested in "artificial cranial reshaping as a 'natural' experimental system in which to study developmental relationships between parts of the growing skull" (Cheverud and Midkiff 1992:167). These studies primarily focused on the causes of wormian bone formations and the premature closure of sutures in infants, although, other pathological conditions were also addressed.

A large group of studies on cranial modification by physical anthropologists since the late nineteenth century have centered on the morphological effects of altered head shapes: cranial morphology, asymmetry, mandibular form, etc. Additionally, there have been several authors (Wilczack and Ousley, 2008; Bennett, 1965; Ossenberg 1970; White 1996) who have pointed out that the practice of cranial modification does seem to lead to other cranial variants during bone growth. Some of these variants include an increased occurrence of wormian bones and premature sagittal synostosis.

Wilczazk and Ousley define and discuss wormian bones, or sutural ossicles. These bones are similar to "isolated islands of bone located within the cranial sutures" (Wilczack and Ousley 2008:483).While it is unclear exactly as to what causes the growth of wormian bones, several authors have hypothesized that cranial modification plays a role in the growth of these cranial variants, where as other authors, such as Ossenberg (1970), have argued that the wormian bones formation is more likely a result of genetics. However, Bennett argues that wormian bones form as "secondary sutural characteristics developed as a response to localized stress caused by growth rate differential" (Bennett 1965).

Ossenberg (1970) argues that rather than localized stress as the cause of wormian bone formation, it is stress which activates genetics that then produce the growth of wormian bones

in the human skull. In her research with the Hopewell American Indian group, she maintains the possibility of an underlying genetic response. Ossenberg theorizes that “perhaps accessory sutures provide extra flexibility to modify and shape the braincase” (Ossenberg 1970:366), allowing for the practice of cranial modification to grow throughout the population. She also argues for genetics by stating, “perhaps in such population differential mortality and fertility favor individuals with an inherited predisposition to form accessory sutures. Thus, in time, selection would result in an increased gene frequency for wormian bones in the population” (Ossenberg 1970:366)

Figure 2.5 Wormian bones present in crania from Pachacamac in Peru. Source Smithsonian Collections *Photo:J.Han*

Wilczack and Ousley appear to agree with Ossenberg. They state that the presence of wormian bones produces greater malleability, and therefore a tendency towards deformation (Wilczack and Ousley 2008). In their research, Wilczack and Ousley concluded that, in fact, there

were no indications that artificial cranial modification practices had led to the formation of wormian bones.

White (1996) analyzed a group of modified crania from the Maya site of Lamanai, Belize. She argues the possibility that, out of need for adaptability and flexibility, the selection for wormian bones may be higher. She explains that wormian bone formation "confers greater bending strength and ability to absorb energy, and therefore be considered an adaptive response to external stress" (White 1996:399). She also states that wormian bone formation and probability may be enhanced by genetics. Therefore, she agrees with Wilczak and Ousley (2008) as well as with Ossenberg (1970)

The consensus from these publications is that artificial cranial modification does not directly lead to the formation of wormian bones, although previous research does indicate that those who are genetically predisposed to the occurrence of wormian bones have increased probability of their formation in artificially modified crania. If the formation of wormian bones were passed along as a genetic trait as a result of practicing cranial modification through extended generational sequences, then this might have been an indication that cranial modification was considered an attractive characteristic when selecting a mate, thus reinforcing a strong social identity within the population.

Another cranial variant that may be related to cranial modification practices is sagittal synostosis, or premature fusion of cranial sutures. Referring to previous research, White notes that in unmodified crania, "premature sagittal synostosis normally leads to a bulging along the sagittal suture lengthening of the skull, cessation of growth along the parietals" (White 1996:404). During her research with artificially modified crania from Belize, White only had a very small number of crania to work with that displayed sagittal synostosis. She does, however,

indicate that of all the samples that she observed, these had the shortest and broadest crania. She also further observed, it "appears that sagittal synostosis in combination with fronto-occipital [modification] exaggerates that shortening and broadening effects previously observed" (White 1996:404).

White (1996) also noted that the premature fusion of cranial sutures occasionally occurs during the intrauterine period. She maintains that extended periods of compression may be a contributing factor. "Babies who descend into maternal pelvis prematurely or for a prolonged period of time experience attenuated lateral construction and a much higher frequency of sagittal synostosis" (White 1996:398). Given that White only had a small sample of crania in which she was able to compare the sagittal sutures, it would be difficult to conclusively state artificial cranial modification affects the premature closing of this suture. Interestingly, however, she does contend that the modified crania only appear to have increased risk of developing this condition.

The Social Role of Cranial Modification

The social context of cranial modification has received very little anthropological attention, although it has been mentioned in a number of recent reports, by archaeologists including, Blom, Eeckhout and Verano. The most widely studied intentionally modified crania are those of the Tiwanaku colonies at Omo and Chen Chen (Blom et al. 1998, Blom 2005, Hoshower et al. 1995, and Janusek 2002). It could be that in these areas, the preservation of human remains is quite high, whereas in other areas, the climate and soil conditions are lacking in preservation qualities. It has been identifyed that cranial modification was practiced in earlier cultures such as with the Paracas people, and the Nazca society from southern Peru (Schijman 2005:947). Hoshower et. Al. (1995), asserts that cranial modification practice was brought to the

Moquegua Valley through the migrants from Tiwanaku. “Moquegua’s Tiwanaku – (the descended population) maintained many aspects of their cultural heritage” (Hoshower et al. 1995:151). By continuing the cultural practices they, would have been able to share ideals with other populations.

One of the larger questions is why did the Andean population practice cranial modification. Several authors (Hoshower et al. 1995; Schijman 2005; Blom et al. 1998) have attempted to answer this question through their research. Blom et al. (1998) believes that the colonies in the Moquegua valley may represent a *mitmaq* type of process similar to that organized by the Inka culture. She asserts that it is possible that distinct ethnic groups may have been relocated to foreign areas to accomplish specific tasks, (such as agriculture), dominant in the Moquegua valley (Blom et al. 1998:254). This would suggest that these colonies were being populated by foreigners during different periods, and for undetermined amounts of time. Therefore, if these areas were populated by various groups of people they may have used cranial modification as a way of identifying themselves among the general population. In essence the various ethnic groups may have been differentiated through the use of cranial modification among other forms of public identification.

Schijman (2005) describes how many of the cranial modification types he encountered tend to reflect the natural landscape of the region. He describes the people from the Arequipa region as using a mold to shape the skull of the infant to resemble the shape of the nearby Misti volcano. This would lend credence to the theory Andean peoples used cranial modification as a type of religious ritual. Similarly, it has been theorized that the Maya cultures used cranial modification to emulate the Maize God. Schijman also states that it is possible that the role and purpose of cranial modification in the Andes is related to establishing an individual’s identity in a

specified social class, and that it is possible that cranial modification would have been restricted to noble and elites (Schijman 2005:947).

Hoshower et al. (1995) would disagree. According to her research at the Omo site, she has found that a majority of the skulls excavated display some type of deformation. Therefore, if the practice was exclusive to the elite population, then nearly all the burials at Omo M10 complex were elites or nobles. However, there is no archaeological evidence to support that these burials were those of elites. She does state that more males than females show slight deformation, and that Posnansky (1957) argues the opposite of Schijman; these individuals with little or no modification may have belonged to a priestly class (Hoshower et al. 1995:152) rather than those of importance displaying the modified crania.

Hoshower et al. instead argues that it is more likely that cranial modification was a method of ascribing an individual to a specific *ayllu*, or household. She provides an example through the Cemetery R excavations at Omo's M10 site; "…an elderly male (R2), a middle aged female (R8), a child of six to eight years (R3), and an adolescent (R7), were deformed in an identical manner with the same deforming apparatus" (Hoshower et al. 1995:156), suggesting that all of these individuals belonged to the same *ayllu*. This would also indicate that the entire group was practicing cranial modification. Hoshower et al. (1995) does not suggest that any of these burials were noticeably more elaborate than another, which would lead to the belief that the burial population may have been equal in social status. Thus, cranial modification would have been comparable to the wearing of a family crest, or, as in Scotland, the family tartan.

One population that may have used cranial modification as a method of segmenting the group by social identity was the American Indians of the Southwest United States. Garrett (1988) researched these socially ranked populations and found there was a relationship

between the practice of cranial modification and a segment of the population, exclusively male, that he considered a warrior class.

Studies with Latin American Remains

Scholarship in Latin America has encompassed all of these research foci: typologies, and classification, health, morphological changes, and social roles. Numerous authors consistently note its use as a sign of group membership, be it regional, ethnic, or familial. In the 20th century, several monographs with Latin American focus concerning intentional head shaping were written.

CHAPTER 3: Theoretical Considerations and Research Problems

Cranial modification is a permanent cultural signifier that is visible in the archaeological record. That makes it a unique feature available for bioarchaeological studies. Given that the family, or perhaps society as a whole, determines head shape, such an examination is one of the more interesting ways to study ascribed identities and the complex society.

The Emergence of Social Complexity

The core concern in this thesis is interpreting the relationship of cranial modification to cultural identity and social complexity. It has been theorized in this paper that the practice of cranial modification among the Maya was a symbol of ethnicity and social identity due to its presence across class lines; in contrast, cranial modification along the coast of Peru does not appear to have marked class or ethnicity, as it does not appear consistently within any one region. It is hypothesized that among complex societies, there will be a pattern of homogeneity among the modified crania. However, there is some scholarly debate as to the extent of purposeful cranial modification. One theory that has been put forward which suggests that cranial modification was initiated among the coastal Andean cultures was more accidental, resulting from the extensive use of cradleboards, rather than from intentional purposeful modification. It was not until much later that intentional cranial modification was adopted as a cultural construct (Verano 1997).

Complex societies are defined based on a series of features, including differential access to prestige, occupational specialization, and the centralization of power (Geller 2004, Tiesler 2001). In the fields of anthropology and archaeology, the focus has been on the role of specific features within a social setting rather than the overarching definitions. A primary signifier of the

emergence of social complexity would be the institutionalized forms of government, the state, operated by individuals dedicated to those roles. Social complexity, in this sense refers to socio-political organization and the presence of a hierarchy, which would include the ruling elite (Tiesler 2001). The ruling elite may have also included scribes, priests, and any administrative personnel employed by the ruling family. This type of society can be recognized archaeologically from the artifacts and structures that are present at a site. These would include administrative and religious buildings, elite residences, and increased craft production areas.

The least socio-politically complex societies are those that are the most egalitarian in nature, generally having differentials based only on age, sex, and acquired skills. A great number of differences between people may arise over the course of life; however, ascribed positions are few (Tiesler 1999a, 1999b, 2001). It is more likely that the permanent symbols used to denote contrasts between individuals in small-scale societies may relate to lineages and particular familial affiliations, or even place of origin. These can be permanent or not. They however, are not associated with ascribed status, but rather with an achieved status, meaning that an individual has the ability to increase social standing through an accomplishment in his or her lifetime.

Some central issues in studies of social complexity that can be examined through the lens of cranial modification concern the social differences that existed, the means of communication to the members of each society, and the impact on the people who experienced them. Cranial modification is highly visible, reinforcing its ability to convey information and serve as a symbol of group membership.

Ethnic Identity

It is critical to examine anthropological explorations of ethnicity, given the preponderance of evidence, suggesting that cranial modification served to denote group identity.

Ethnic groups must self-identify, and, furthermore, cultural differences are strengthened where different ethnic groups interact. Consequently, recognition of ethnic groups by outsiders is pivotal to their function (Blom, 1998). The method by which members of a specific group would recognize others as belonging to different groups was the display of cultural values (Barth 1998, Chapman 1993). These cultural values were often exhibited through 'cultural context' using signifiers such as clothing, architecture, and lifestyle (Aldenderfer and Stanish 1993, Jones 1997). It would appear that in the Maya regions cranial modification functioned as a method of symbolizing membership within the group. As a method of ascribed status, cranial modification was instituted at a very early age, and, therefore, it would appear that modification of the crania was a permanent symbol of these communities.

Head shape is a strong statement about group membership. Unlike other indications of group membership, such as wearing special clothing or even tattooing, having the possibility of being changed or covered, whereas cranial modification would be visible to all within the community, as well as foreign populations. Cranial modification though differs from other methods of displaying group membership, the crania cannot be hidden nor can the modification be reversed, thus making this type of symbolism both public and permanent.

The Cultural Body

Artificial cranial modification used as a permanent symbol on the body can also be viewed more generally as a vehicle by which individual social identity is constructed. The purpose behind the act of cranial modification was to relate to outside populations the group membership of the individual. For instance, in the case of the Maya, it is hypothesized within this thesis, that the population as a whole would practice cranial modification as a symbol of their membership within the group.

In addition to stylistic interpretations of the body, it is theorized that the body is malleable and can be constructed by the society in which it participates. It has been suggested that the body is a canvas upon which society can apply specific symbols to indicate group membership (Synnott 1993:4). Turner (1980:112) states, "The body as the common frontier of society, the social self, and the psycho-biological individual, becomes the symbolic stage upon which the drama of socialization is placed." In addition to creating this self-identifying symbol, Geller (2004) also suggested cranial modification may have been a method for molding individuals for their life responsibilities, including both gender roles and occupational roles. She states that this future path of social identity was predetermined by the modifier. Another example of this is Joyce's (2000:474-475) view that Aztec children were "[p]resented at birth as raw materials…that were shaped into body ornaments". Thus, as using the body as a canvas upon which society can place markers, those who share the same marker are then understood to be a member of the society. Social construction of the body is of particular interest in the analysis of cranial modification; the body can be constructed as a symbol of the society, as a marker of group identity.

Body modification is one method of marking observable ascribed traits that populations have used to distinguish themselves from other populations throughout history. These signifiers mark personal identity while simultaneously demarcate unity within a society. From this understanding, the human body becomes the crossing point between the individual and the group (Durkheim 1952 [1897], Foucault 1979, Lock 1993, Turner 1980). " By creating differences that are not present at birth and by giving them meaning to these differences, 'cultural bodies' are constructed, and symbolic boundaries created" (Blom 2005:2).

Many body modifications are used to project group membership. These can take the form of temporary changes such as dress, paint, and headgear, or be more permanent alterations to the body. Though this position will be a temporary after the individual becomes a member of another group, in this instance they are transitioning through what anthropologists refer to as a liminal space. Liminal space is when a member of one group is transformed, through specified actions, into another group.

The use of the human body to create differences and similarities in a society where they do not necessarily exist biologically is a crucial conception for understanding the use of intentional head shaping in prehistory.

Theoretical Implications

Theoretical of literature can be used to better understand the implications of cranial modification in different societies and how this was part of the identity of the individual and the group. The following section will present the specific problems that are illuminated through the analysis of several hundred crania from the pre-Columbian Andes, as well as a sample collection from the Maya cultures.

Research Problems

The foundation of this thesis is based on works focusing on complexity, ethnicity, and the relationship to the body modification. Provided that cranial modification is a cultural construct placed upon the human body, the overarching inquiry of this thesis will be to address cranial modification as it is carried across class lines throughout the Pre-Columbian Andes and Maya regions. The hypotheses to be tested through this thesis are structured as follows: 1) the effects of sex and geography on the expression of modification 2) the relationship between modification practices and identity, and 3) the use of two particular sites to test the hypothesis: Blue Creek, Belize and the Andean site of Pachacamac. These two sites are used to exemplify and illustrate the distribution and frequency of cranial modification.

At the Blue Creek site in the Maya region, it is hypothesized that there will be a pattern of homogeneity in presence, but there will be variation in modification type.

Alternatively, the Blue Creek site will have a lack of modification in both presence and homogeneity, provided the site's locus as a trading port. For the Andean site of Pachacamac, it is hypothesized there will be a lack of homogeneity, as well as presence, due to the site's status as a large pilgrimage center. However, if the burial population represents a local residential population, there may be homogeneity present in the cranial shaping. Regarding analysis on the effect of sex on the production of cranial modification, it is hypothesized that for both the Andean and Maya populations, sex was not a factor in determining if cranial modification would be performed on an infant.

Cranial Modification

Cranial modification is an alteration to the body that can be constructed by society to represent certain ideals. Given that complex societies seek to create a cohesive unit out of disparate peoples it would be expected that they would use the modified body for this purpose.

As has been indicated by the theoretical interpretations of social complexity, it is possible that state level or stratified groups will exert control over the practice of head shaping in order to create cohesion within their group. Consequently, it is expected that individuals will display great homogeneity in presence and/or type of head shape within the cemeteries of complex societies in the Maya region. Since head shape will cross all social levels, there should be no relationship between the practice and indicators of status. In contrast, for the Andean populations, it is possible that stratified groups are using modification, or a lack of modification, to indicate groups within their society, possibly based on status. In this case, we would expect diversity in either presence or absence, or in types, and a correlation with the indicators of status analyzed in this paper.

CHAPTER 4: The Sample

Over 1600 crania from 12 sites were examined for this project. There were 586 crania from Pachacamac that were analyzed for presence, type and degree of cranial modification. 1038 crania were analyzed in previous literature, and there were 63 crania that were analyzed through data that was provided by Dr. William Brown of the Maya Research Program. All of the crania are from the pre-Columbian Andes and Maya regions. These areas have been a focal point for archaeological and osteological research for over a century, and, as a result, numerous skeletal collections are available for study. Many areas have been thoroughly investigated, and outlines of prehistory are well known.

Location	Modified	Unmodified	Unknown
Maya	715	268	118
Andean	478	24	0
Total	1193	292	118

Table 4.1 Distribution of modified crania over geographic locations. *Source:* Cranial evaluations J. Han

Maya Cranial Modification

Late Preclassic Period	Classic Period	Late Classic Period	Post Classic Period
300BCE – CE250	CE250-600	CE600-900	CE900-1500

Table 4.2 Maya chronology *Source: After V. Tiesler 1999*

Historical Background

The Maya consisted of a complex society with varying degrees of social hierarchy. Therefore, membership may have been denoted by the use of cranial modification. The information analyzed indicates a large portion of the population practiced this activity from at least the Preclassic period.

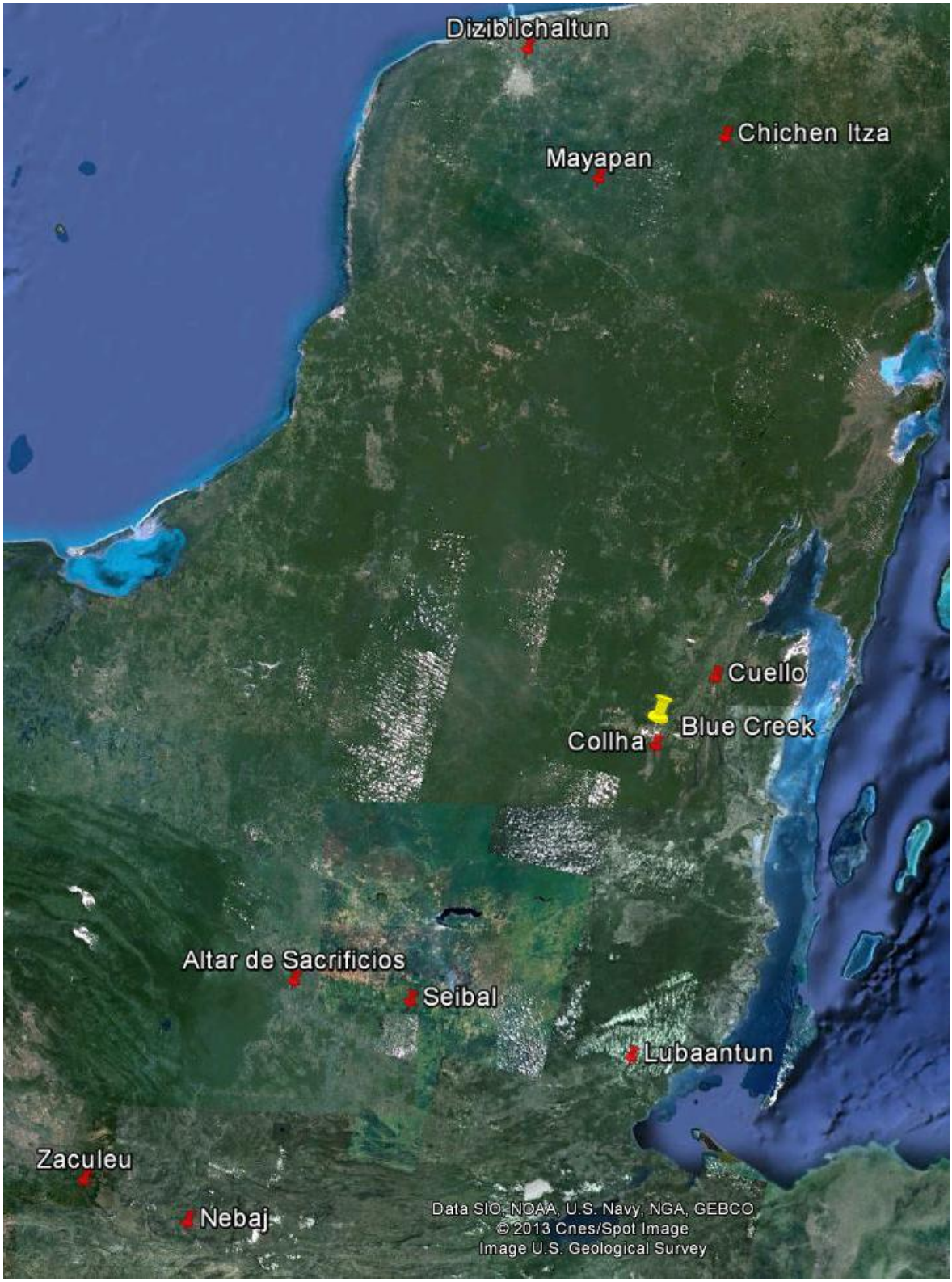


Figure. 4.1 Locations of Maya sites analyzed. Source: Google earth.

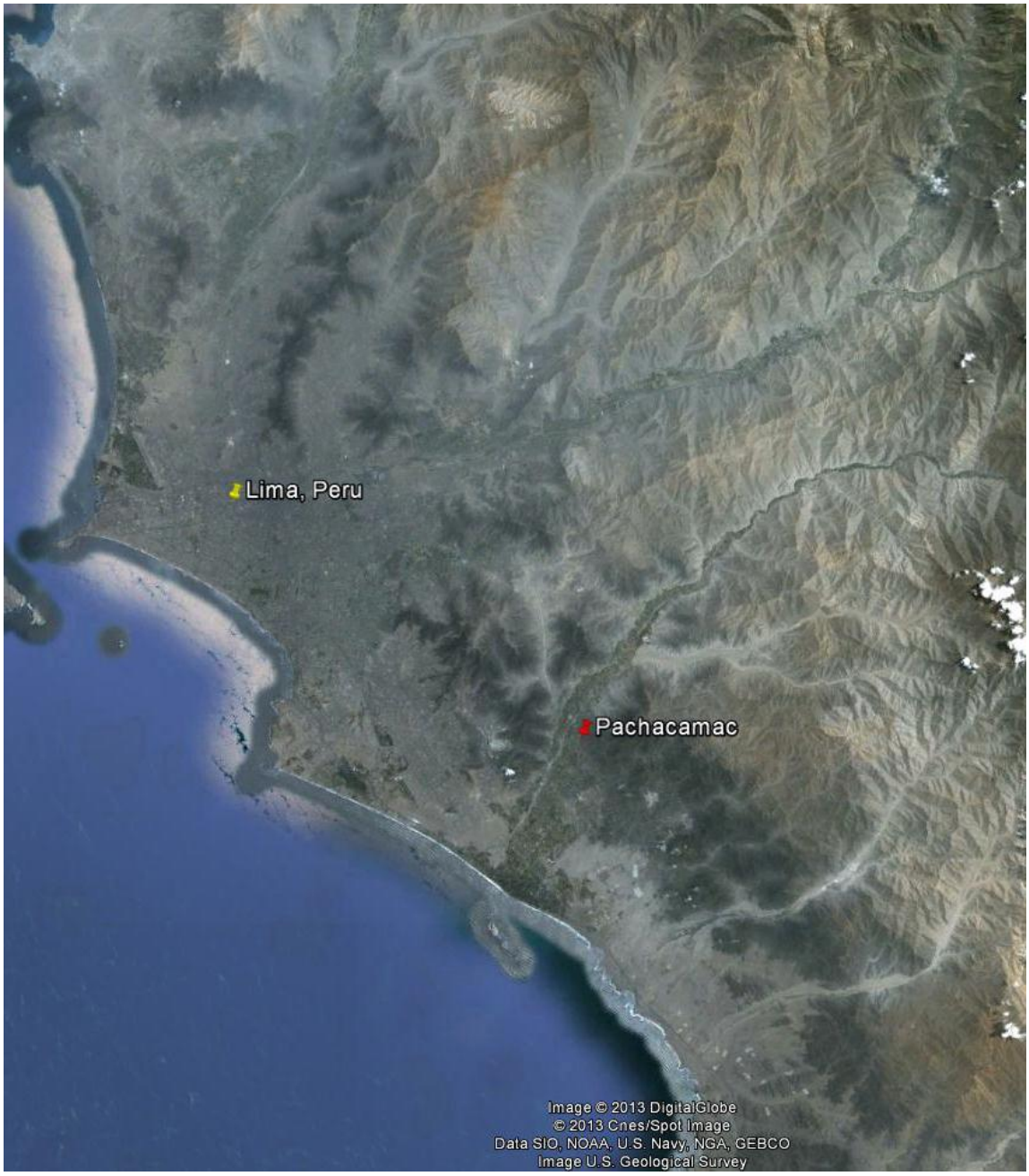


Figure 4.2 Location of Andean site of Pachacamac. Source: Google Earth.

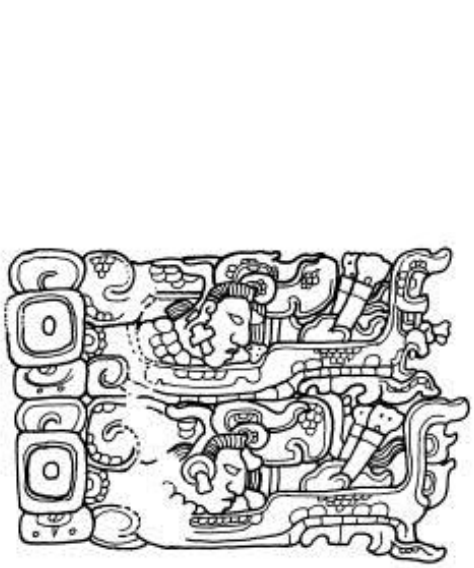
In the Maya society, there existed varying levels of status. Among those were a ruler and his family and a royal court including priests, scribes and other administrative nobles. In this socially complex society, there also would have been craft specialists and individuals with dedicated duties, such as traders. Finally, there would have been the commoners, primarily made up of farmers and others without specialized institutions.

The ancient Maya are often associated with the practice of cranial modification (Agrinier 1964, 1978; Coe 1959; Dingwall 1931; Feindel 1988; Fry 1956; Gann 1918; Kennedy 1983; Massey 1989; Ricketson 1937; Saul 1972, 1975; Stewart 1953, 1975; Tiesler 1999). According to Saul (1972:3), many early researchers only noted those crania which had been modified or the portion of the crania which showed signs of modification. More often, the crania which did exhibit signs of modification were disposed of as they were considered useless to the research. After some time, it became evident that cranial modification was a culturally controlled trait with information to be gained, such as the cultural diffusion and population movement. (Saul 1972; Stewart 1953).

During the Classic period it would appear that the practice of cranial modification was reserved for those only of elite status, with the tabular erect variety appearing most often (Tiesler 1999a, 1999b, 2001). Some researchers have suggested that the practice of cranial modification arose from the tradition of mothers using a cradleboard to transport and restrain infants (Saul and Saul 1989:293). According to the work by Haviland and Moholy-Nagy (1992) in Tikal, Guatemala, the asymmetrical variation seen in the crania is a probable result of cradle boarding that was performed by the elite (Haviland and Moholy-Nagy 1992:43). By strapping the infant to the cradleboard, the occipital was unintentionally flattened. It is possible that, over time, the mothers, along with society in general, began to find this trait as attractive, resulting in intentional cranial modification practices. It would seem natural that, if the elite were practicing the cradleboarding technique, the intentional cranial modification would have initiated within their social realm. According to the work of Haviland and Moholy-Nagy (1992), the deliberate cranial modification was in fact initially carried out by the elite before being adopted throughout the population (Haviland and Moholy-Nagy 1992:43-44). Thompson (1954) states that, based on the carvings found at several Maya sites, it would appear that the artificially modified crania

were a symbol of great beauty (Thompson 1954). Others have theorized that the Maya intentionally modified the crania of infants so that they would resemble the preeminent Maize God (Houston et al. 2006). Iconography would support this theory, and suggests that the Maya had practiced a type of cranial modification that produced an effect on the crania that would allow them to emulate the Maize god, an important figure in Maya mythology and the basis for which most life was centered.

As a reflection of an individual's social status, it may have been that those of ascribed rank were subject to cranial modification in an attempt to reflect the body as constructed of maize. Additionally, modifiying the crania to the shape of corn would allow the placement of the royal headdress, making it easier to wear the symbolic tumpline. This was one of the burdens of rulers to emulate the gods, who wore tumplines to carry time (Duncan and Hofling 2011, Houston et al. 2006, Rice 2004). Depictions of the Maize God, as well as individuals dressed like the Maize God, are found througout the Maya region. Therefore, it is possible that the elites modified their crania in order to emulate the appearance of this specific deity.



a.

c.

d.

Figure 4.3 a.) Detail from stela showing stacked witz monsters with Maize God seated in eye socket (Bonampak) b.) Detail of individual dressed as the Maize God (Uaxactun) c.) Detail of Honul dancer or Hun-Nal the Maize God dancing while wearing a snake throne backrack. D.) Bust of young Maize God from Structure 20l22 (Copan) *Source: Linda Schele Collection.*

As is shown by Figure 4.3 the Maize God was depicted with a cranium shaped to resemble a corn stalk, with additional apparatuses emerging from it. Figure 4.4 demonstrates how the ruler made an effort to resemble the Maize god, even going as far as to wear an elaborate headdress with the additional apparatuses emerging from within. The two citizens who are seated before the ruler in this relief also display modified crania, lending to the belief that these two individuals would represent citizens of the state and not outsiders. In the representation Figure 4.5 there are individuals depicted as Maya with clearly modified crania, and then an individual who is depicted as non-Maya with unmodified crania, suggesting that cranial modification was part of being Maya.

Figure 4.4 Stucco relief at the Palace, Maya ruins at Palenque as drawn by Ricardo Alemendáriz at the time of the Del Rio expedition in 1787. Source: Library of Congress.

Figure 4. 5 a) Maya figures seen in the Oval Palace Tablet from Palenque (after Schele and Freidel 1990:Figures 6 and 7); b.) Non-Maya figures represented in Stela 11 from Seibal. Contrast the different representations of the Maya and non-Maya individuals' head shapes (after Graham 1996:34)

As previously noted most early archaeologists believed that the modified crania were useless, and discarded with only a simple note about their existence (Saul 1972). Many of the early New World archaeologists, such as Thomas Gann, 1897, held the belief that deformed crania were of little use in the study of the cultures of the Maya regions. Although they were disposed of, there were archaeologists, such as Gann, who did, record extensive notes. This allowed the publishing of many reports once the significance of these crania was realized.

From Tiesler's work spanning the Preclassic through the Postclassic, it would appear that cranial modifcition was fairly consistant. She stated that from the 37 Preclassic crania examined, 29 displayed modification (n= 78.38%). Of the 110 examples of Classic period crania, 67 displayed cranial modification. Of the 151 Postclassic crania that were examined, 134 of those displayed cranial modification(n=60.91%) (Tielser 1999b). This would contradict the theory put forth by Haviland and Moholy-Nagy (1992), that cranial modification was first adapted by the elites who had been subjected cradleboarding as infants.

Many researchers have noted the presence of cranial modification in the Maya, beginning during the earlier Preclassic period (Agrinier 1964; Coe 1959; Dingwall 1931; Feindel

1988; Fry 1956; Gann 1918; Kennedy 1983; Massey 1989; Ricketson 1937; Saul 1972, 1975; Stewart 1953, 1975; Tiesler 1999b). The research proposed by this project is to determine if cranial modification was practiced with ubiquity throughout the state.

Maya archaeologists continue to use the method of typology, set forth by Dembo and Imbelloni (1938). However, the method is not without its problems. The poor preservation of skeletal remains in the Maya region is the biggest hindrance (Saul 1972). Many of the remains are fragmentary and must be reconstructed, and are usually not complete, limiting the effectiveness of cranial measurement. Of course, visual inspection of cranial modification is subjective, lead to inter-observer variation in interpretation regarding the same specimen. One may even discover that revisiting previously recorded crania may provide a different view.

Classic Period & Postclassic Period	Tabular Oblique	Tabular Erect
	Male	
Nebaj	4	1
Altar de Sacrificios	1	5
Lubaantun	0	2
Dzibilchaltun	0	1
Colha	0	3
	Female	
Nebaj	0	0
Altar de Sacrificios	8	1
Lubaantun	0	0
Dzibilchaltun	0	2
Colha	1	1
Total	**14**	**16**

Table 4.3 Showing distribution of cranial modification variation at Maya sites.

Though this table shows a distribution of Maya crania for the Classic and Postclassic time periods, the information for Blue Creek was omitted due to the unfortunate lack of specific temporal information. Information from Blue Creek only determines that the site was in use as an urban center from the Preclassic periods through to the Terminal Classic period. However,

there is not a distinction for the recorded burial populations. This information will be reviewed, and a more in-depth analysis of the cranial modification will be discussed in Chapter 6.

Andean Cranial Modification

Culture	*Lima*	*Wari*	*Ychsma*	*Inka*
Period	**Early Intermediate**	**Middle Horizon**	**Late Intermediate**	**Late Horizon**
Approximate Dates	200BCE-CE650	CE650-1000	CE1000-1470	CE1470-1533

Table 4.4 Chronology of Pachacamac, Peru. *Source: after P. Eeckhout 2013*

Pachacamac, located on the coast of Peru, has been regarded as a unique site. Unlike the poor preservation conditions in the Maya areas, Andean regions promote the preservation of remains. The climate and soil conditions mimic those of the arid Egyptian desert, making for excellent preservation of even the most fragile textiles, along with human remains.

Pachacamac as a pilgrimage center, it could be hypothesized that a variety of modification styles would exist. However, if not found to be the case, there are a series of possible hypothesis that might explain the difference. First, the crania may only represent one particular group. For example, certain cemeteries may have been utilized by different population groups, which would result in geographic separation of skeletal remains. Secondly, there is a possibility that the sample may represent only the local population who lived day to day in the center. Third, though contrary to the ethnohistoric records, the possibility must be considered that Pachacamac may have only served as a religious center for a local population, and was a pilgrimage center to the larger foreign population.

Historical Background

Social complexity among the Andean societies did not differ much from the Maya society. There would have been rulers with households that would have been comprised of

administrative leaders and priests. A large difference between the two is the lack of scribes in the Andean social elite. This is due to insufficient proof of a written language such as has been uncovered in the Maya society. In addition to these elite households was the population of commoners, similar to the population by the same name in the Maya society.

The ethnohistoric and archaeological evidence has demonstrated that Pachacamac once functioned as the paramount Andean pilgrimage center, and, consequently, became a very large urban settlement. In 1910, over 2,200 crania were collected by Aleš Hrdlička and the majority of these crania are still housed at the Smithsonian Institution's National Museum of Natural History in Washington D.C.. This collection comprise those crania deemed by Hrdlička as "better preserved", gathered from the ossuary areas of the site, as well as at the Inka temple (Hrdlička ms:622). The site being looted for pottery in the burials and so he was unable to use a systematic approach, to gathered the complete with more specific provenience, but acquiring the remains from the debris piles. After collecting the crania, Hrdlička packed them in Lima for shipment to Washington D.C.. in this study data were collected on a total of 586 crania from Pachacamac.

Conclusions

Within the Andean society, it would appear that cranial modification was performed without a requirement of elite status. This can be determined due to the large numbers of crania that display modification. However, it is possible that, similar to the Maya, cranial modification began through the practice of cradleboarding infants that became a popular method of denoting ones membership within the community. Also as speculated with Maya populations, cradleboarding itself may have begun as an elite function, eventually becoming a popular method of signifying membership within the group.

CHAPTER 5: Bioarchaeological Methods

Bioarchaeology is the study of human skeletal remains from archaeological contexts. Defined in 1977 by Jane Buikstra, bioarchaeology in the United States refers exclusively to the study of human remains found at archaeological sites. A bioarchaeological approach is particularly appropriate for the examination of the role of cranial modification in society since it is a cultural alteration of the skeleton.

Sampling

The samples used in this project were chosen for a variety of reasons. Attempts were made to secure temporal placement as well as a broad geographic distribution. The Pachacamac crania were included, (despite the lack of cultural context) for a number of motives. Preeminent among these is the importance of this site. Additionally, the sample of Pachacamac is very large (N=586), and can provide very strong statistical data for examining the effects of cranial modification on the individual, as well as the population. The other sample from Blue Creek was chosen due to the extensive amount of data that was provided by the Maya Research Program and William Brown. This sample was also quite large (n = 63) for a Maya region excavation.

In order to assess the prevalence, types, and distribution of head shaping in the sample, an assortment of methods were employed. Since this examination relies on the use of cranial modification as a visible signifier, only complete crania were used in this analysis. Fragmented or mostly incomplete crania would not allow for a thorough examination of the head shape. Sex determination was based on the information that was provided from the accession cards on file at the Smithsonian. Using Andean archaeological collections, Cocilovo (1975) has demonstrated that cranial modification does not greatly affect sexually dimorphic cranial features.

Classifying Head Shape

Each cranium was measured to quantify the presence, category, and type of modification. In the Andean area, the most common categories are annular, in which bandages are used to force the head into a conical form, and fronto-occipital, or tabular, in which stiff pads or boards are used to flatten the front and back of the head while allowing for parietal expansion (Dembo and Imbelloni 1938:249-277)

Crania were also scored independently for anterior and posterior degrees of modification using a five point scale (0-4). This scale was developed by Wilczak and Ousley (2009) when they were analyzing crania from Hawikuh, New Mexico. This scale uses the occipital as a point of measurement and visible determination of flattening. Crania lacking in any visible flattening of the occipital were scored 0. In crania where the flattening occurred ¼ of the way, intersecting the lambdoid suture, the score was "1". Crania that presented flattening ½ of the way intersecting the lambdoid suture were given the score of "2". Any cranium where ¾ of the occipital was flattened the score received a score of "3", and all crania with an entirely flattened occipital scored a "4". During the analysis of this sample, both spreading calipers and sliding calipers were employed, using measurements to determine if crania were modified by a predetermined measurement as a guide. It was decided anything exceeding that measurement constituted a level of modification. Presence or absence was determined based on the visibility of the modification and the aforementioned measurements.

Hoshower et al. (1995) use only three forms to describe the variation seen in their sample. Their focus in the classification was based on the modification apparatus. Whereas, in this project only the effect on the crania was considered, not the apparatus which created the modification. Cranial modifications association within the social construct is primarily

dependent on either the presence or lack of presence of modification within the samples examined.

Scoring crania for this study between the modified and unmodified is based on visual assessment and the measurements taken. Of course, there is not a high level of consistency between the modified and unmodified; however, general differences are present. It should be considered that the head binding itself was an important act, as well as that small nuances in head shape would have been masked by hair, tissue, and headwear in the living population. The Dembo and Imbelloni classification system highlights the most important visible feature of the practice of cranial modification: the difference between the broadened skull and the lengthened one.

Paleopathology

Certain paleopathology indicators were recorded not only to determine an individual's health, but also to explore possible correlations between modification patterns and social standing. It is generally believed that, owing to control over resources, members of the elite groups would be better buffered against stressors. It is often difficult to identify the specific cause of disease from skeletal remains. Moreover, not all episodes of stress will affect the skeletal system.

Archaeology

Sites were selected to encompass as much variability in geography and social organization as possible. Data were collected about the mortuary practices of these samples whenever such information was available. Burial structures were examined with attention to whether individuals were buried directly into the ground or there were preparations

surrounding the treatment of the dead. Additionally, if detailed context was available, burial goods were inventoried and classified according to perceived function and material. This information will also serve for an investigation into the social context of different individuals.

Conclusion

This chapter presented the approach that was used in this project. It is an attempt to clarify the intertwining of biological and archaeological data to explore the social role of cranial modification. The remainder of this thesis will detail the results and conclusions derived through application of this methodology to a large Andean skeletal sample, followed by a more detailed investigation of cranial modification in Maya and Pachacamac.

CHAPTER 6: Results

This chapter provides a synthesis of the research conducted for this project. The analysis of the entire sample for cranial modification will be presented.

The Effects of Geography and Sex

Geography and sex are factors that might influence the patterns of cranial modification seen in this sample. For the purposes of this discussion, analyses were conducted in order to determine the influences, these variables had on cranial modification. For geography, the hypothesis considered was that Maya societies practiced distinct and intentional forms of modification, whereas the population in Pachacamac unintentionally modified crania through use of cradleboarding. The use of the cradleboard in these societies would have been an everyday occurrence. Cradleboards allowed caregivers freedom to continue with daily activities while still allowing for infants to be near. For example, if a caregiver had the need to work in an agricultural field an infant could be swaddled on the cradleboard which could be fixed to the caregivers back or propped up nearby.

For sex, the hypothesis tested was that sex has no bearing on the presence and type of cranial modification in either of the geographic locations. Both hypotheses are supported by previous research on cranial modification in both the Andes and Maya.

Geographic Variation

As noted previously, it has been argued that geography can have a profound impact on head shape in the Maya and Andean regions. The sample was divided into Andean and Maya populations.

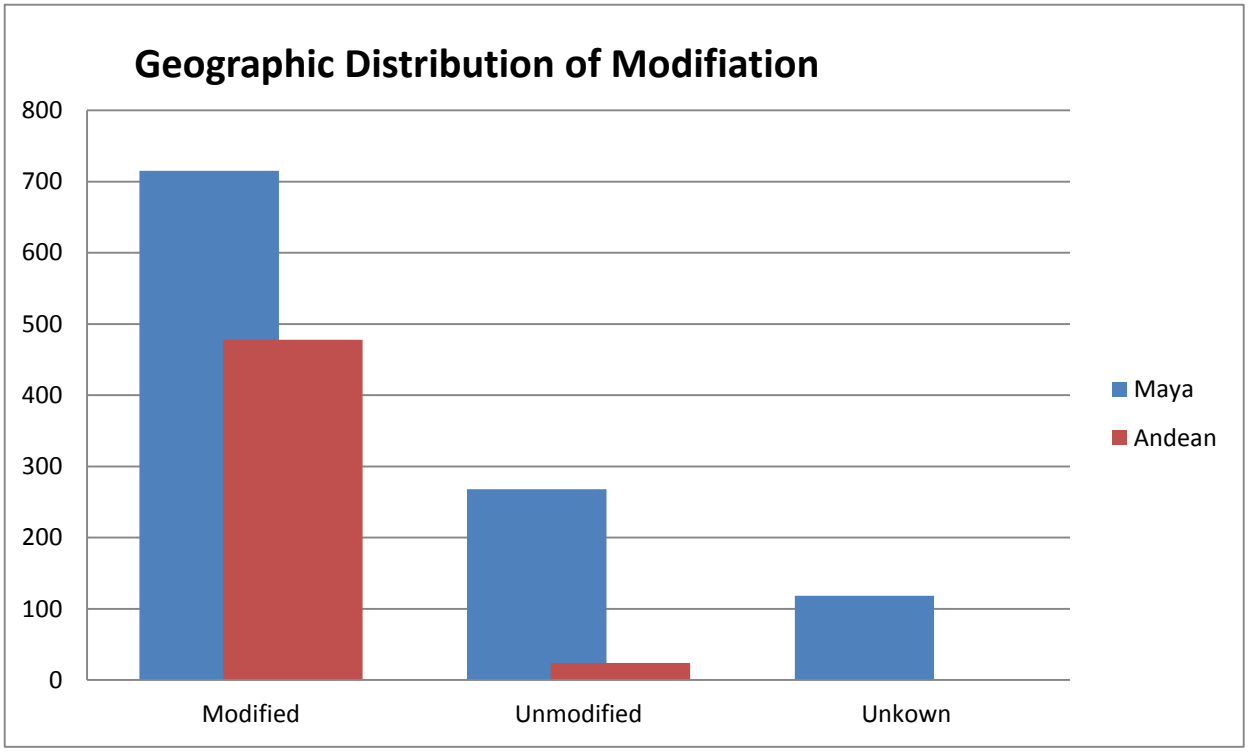


Chart 6.1 Geographic distribution of cranial modification.

There were highly significant differences between the groups, highlighted by the presence and type of modification. In the sample population analyzed during the course of this project, it would appear that that the Maya regions had more flexibility in the practice of cranial modification than was available in the Andean populations. Though, for a more in-depth understanding, a breakdown of the analysis is provided.

MAYA REGIONS

Figure 6.1 Map of Maya sites discussed.

Sex Differences

The following analyses for sex differences in head shape were conducted with only adult crania. The sample size for this examination is 44. For this portion of the analysis, the crania that were examined by Tisler in her study were omitted due to lack of information regarding sex and modification variation. Only crania where that information was available were used.

Finally, sex differences in head shape were considered at individual sites as well as in the sample as a whole.

When category and type were considered, the results showed differentiation in cranial modification distribution by sex for the Maya regions. For the Maya population, the results indicate that, in the male population, the Tabular Erect variation was more popular, whereas with the female population, it would appear that the Tabular Oblique, or single bone flattening, was preferred.

Sex	Tabular Oblique or Frontal or Occipital alone.	Tabular Erect	Total
Males	6	16	22
Females	13	7	20
Unknown	0	2	2
Total	**19**	**25**	**44**

Table 6.1 Distribution of modification based on sex. *Source: William Brown bioarchaeologist at Blue Creek*

The Relationship between Head Shape and Social Organization

Given the cautions noted above concerning sex and geography, analyses can be conducted to determine the relationship between cranial modification and social complexity.

The following sections will examine cranial modification independently in the society portions of the sample before making comparisons of between the two.

MAYA AREAS

For the purposes of this study, both reports and raw data from the archaeological site of Blue Creek in Belize were analyzed. This included crania from several sites throughout the Maya regions. In Chapter 7, a case study of one particular site will provide an in-depth analysis of the Maya cranial modification practice.

It is hypothesized that the crania from this site will be found to be homogenous in nature, due to the belief that cranial modification at Maya sites was the primary symbol for membership in the community. In addition to homogeneity, there should be no paleopathological indicators that would differentiate status of the individuals of this population. In contrast, if there is variation in cranial modification, or lack thereof, then it would be expected that presence of modification and/or type will correlate with social status, as indicated through mortuary practices or artifacts.

Presence and Type of Cranial Modification

As was expected, there was a population of burials which presented cranial modification. Unexpectedly, there was the large frequency of burials (n=183) which did not present cranial modification. There are several alternate hypotheses that might help explain this, including the high probability of poor preservation in addition to the variation of independence between each of these sites.

Temporal Perspective

For the sample site of Blue Creek temporal perspective was considered. However, the information that was provided regarding this site only indicated the site was in use from the Preclassic through Terminal Classic periods. The burials analyzed were not provided a temporal time frame. Many of the other sites had temporal information provided; specifically, the Classical Periods.

ANDEAN AREAS

For the purposes of this study, crania from only one site were analyzed. The Andean crania that were sampled were all collected in the Pacahacmac area of Peru.

It is hypothesized that complex societies will regulate the practice of cranial modification. This may result in homogeneity throughout the cemetery that shows no relationship to paleopathological indicators. In contrast, if there is a variation in cranial modification at this site, it would be expected that presence of modification and/or type will correlate with social status as indicated through mortuary practices or artifacts.

Presence and Type of Cranial Modification

At Pachacamac included in this analysis, there is a substantial presence of cranial modification. This was unexpected in light of previous theories that the Andean populations did not practice intentional cranial modification on a large scale, as expected with the Maya. Due to the nature of the site of Pachacamac a wide variation in cranial modification was expected. Pachacamac being a large regional ceremonial center would have attracted populations from both the highlands and the coastal areas, where it is known that there are distinct differences in cranial modification.

Temporal Perspective

Temporal changes in the practice of cranial modification were also considered. However, temporal assessment cannot be employed at Pacacamac due to the fact of commingling and surface collections at the site.

Cranial Modification

MAYA SOCIETIES

Some internal consistency exists in head shaping patterns seen in the crania from the Maya societies. Historical records from the Spanish on the observation of the practice leave a record of cranial modification; there are written recordings from the Maya by de Landa in 1566, among others. Some ethnographic accounts provided by de Landa after observing the practice within Maya society are:

> "Four or five days after the child was born they laid it on a cot made of rods face down, with the head between two pieces of wood, one on the occiput and the other on the forehead, tying them tightly and leaving it suffering for several days until the head, thus squeezed, became permanently flattened as it is their custom" (de Landa 1566).

While de Landa's account only covered a few days, it is more likely this process probably took up to a full year for completion. Melvin Moss (1958:281) reiterates this by saying, "deformation is a dynamic rather than static process."

Since cranial modification was performed on both male and female infants, it could be hypothesized that the art was practiced by females, as ethnohistorical documents indicate that they were the primary caregivers to children. It also might be hypothesized that, as with tradition and art, the knowledge of cranial modification was passed down through a female generational sequence (Duncan and Hofling 2011, Tiesler 1999). In addition to assuming that

this art was passed down through the female lineages, it may also be determined that, since different areas appear to have slight variations in modification technique, the custom may have been specific to individual housing complexes within Maya society. The housing complexes that were constructed during the Classic Periods were comprised of a series of structures including residential, religious, and administrative buildings. The individuals residing in these complexes would have had a shared status. Thus, there would have been a royal complex, which would have been the largest and would have included the religious and administrative buildings as well as being the center of the site, a complex for the elites and nobles and a separate housing complex for the craftsmen, traders, and farmers, which would have been the smallest and farthest from the center of the site. There appears to have been diversity even within certain groups, which allows for the inferences concerning residential organization and identity (Tiesler 1999).

Cranial modification has been revealed to be an important component in Maya social integration or group identity. In Maya cultures, modification may have been produced by different techniques. However, technique did not indicate a difference in status. The use of assorted modification devices would have resulted in minor variations among the modified crania, but like status, this was only an indication of the variation of prescribed form, not of different form of modification.

Figure 6.2 Infant wearing a modification device (Tiesler 1999)

For the Maya, it appears that cranial modification practices were a part of the typical course in life, and even an important rite of passage. This indicates, as previously stated, that the practice of cranial modification could be considered a passage through a liminal space. Duncan and Hofling (2011) suggest that cranial modification was a method employed that would embody all the appropriate messages of being Maya, and, therefore, prior to the modification process, one would not be considered a part of this group (Duncan and Hofling 2011:201). This is also suggested by archaeological finds of artistic references to modifying apparatuses, discovered on musical instruments commonly used to accompany rites and rituals.

Looking at a sample of "1,515 individuals from 94 sites in the present day Mexican states of Campeche, Yucatan, Quintana Roo, Tabasco, and Chiapas, as well as the Guatemala and Honduras….88.65% of the crania evaluated were artificially shaped" (Tiesler 1999). This

information allows the conclusion that most of these populations were practicing cranial modification in some form, and, with a percentage that high, it can also be concluded that this was a social practice unrestricted by social ranking.

It is interesting to speculate that, for the Maya, the homogenous use of one modification form implies there was some type of social control over head shaping practices in their society. These results offer strong support to the idea that complex societies employ cranial modification in a more standardized fashion, and, perhaps exerted some type of control over implementation of the practice within their group. This would correlate with a desire to unify the group under one political entity, or to exhibit group solidarity to outsiders.

Additionally, none of these samples displayed a relationship between cranial modification, either presence or type, and any of the health indicators included in this study. This implies that for these societies, head shape was not related to individual status as evidenced through health. This is not surprising given the prevalence of head shaping and the homogenous way in which it was used in many of these societies.

Cranial modification patterns are quite distinct in the complex societies. As posited in Chapter 3, in state level and otherwise complex groups, there is generally a quest to unite disparate parts and peoples under a common political or social structure. It also appears that the state has the ability to exert a degree of control over the bodies of its members, be it willingly or through coercion. In a sense, the people themselves symbolized their society in a highly visible and permanent way.

From the 1940s through modern day archaeologists have researched and examined crania from the Maya region. Hundreds of crania spanning the Preclassic to the Postclassic periods have been identified, measured, recorded in the study of cranial modification of the

New World. Sites like Chichén Itzá, Mayapan, and Cuello, have all be excavated by archaeologists, including; E.A. Hooten, T.D. Stewart, E.I. Fry, V. Tiesler, Massey, and Saul and Saul. Their work has provided evidence that cranial modification appeared throughout the Maya regions, although always as a fluid construct with changing patterns throughout the society. (See Appendix)

Figure 6.3 Modified Maya crania, exhibited at the *Museo Nacional de Antropologia e Historia*, Mexico

From Tiesler's work spanning the Preclassic through the Postclassic it would appear that cranial modifcition was consistant. She stated that, from the 37 Preclassic crania examined, 29 of those displayed modification. From the 110 examples of Classic period crania, 67 displayed cranial modification. Of the 151 Postclassic crania that were examined, 134 of those displayed cranial modification. (Tielser 1999b).

For the last 25 years, excavations at Blue Creek, Belize have been ongoing. Archaeologists at this site have thus far excavated 63 burials (males = 17, females = 20, unkown = 22 and subadult = 10). Of the adults it was determined that 45 (males = 13, females = 12, unkown = 20) did not demonstrate any type of cranial modification styles, and 15 (males = 5,

females = 8, unkown = 2) presented some form of cranial modification. Of the subadults, none presented any type of cranial modificaiton.

Stewart (1975) acknowledges a spatial and temporal pattern to the distribution of cranial variation in an overview of modification in the Maya area. Stewart states that during the Late Classic and Postclassic Periods, the tabular oblique variation was predominant. He goes further to note that tabular oblique appears most often during the Early and Late Classic periods at Zaculeu and that tabular erect only appears during the Postclassic Period at the site.

Saul (1975) concurs with the earlier finding by Stewart that the tabular oblique variety was dominant through the Late Classic. Saul (1972) asserts that, additionally there may have been a divide between the sexes with regard to cranial modification. During the Late Classic, the tabular oblique style was seen in both male and female crania. However, by the Postclassic Period, only female crania showed traits of tabular oblique and only male crania showed tabular erect.

Evaluation of the crania from the sites investigated by Hooten, Stewart, Fry, Saul and Saul, Massey, and Tiesler, do seem to give an indication (Appendix A) that during the Classic period there was a preference for the tabular oblique variation of cranial modification. However, it does not appear that there was an exclusivity of tabular oblique to females and tabular erect to males during the Postclassic. Both sexes continued to practice both variations of cranial modification.

These temporal changes were noted in both the broad category of modification as well as in the specific type. Individual sites were examined for sex differences in cranial modification practices. There were no significant differences between the sexes in either presence or type of cranial modification in the Maya regions.

Although the evidence does seem to support the findings that during the Postclassic males did not practice tabular oblique type cranial modification, it is important to remember that, for the purpose of this project, the sample size was quite small. One of the more surprising results from this data is the larger number (n = 55) of unmodified crania from Blue Creek. This may be an indication that cranial modification was neither a state controlled nor religiously controlled practice. An alternate theory might be that polities with a capitol and periphery sites independently controlled the practice of cranial modification. Blue Creek sat near Tikal, and between Collha and Cuello. Collha, like Blue Creek, has a larger number of unmodified crania than modified crania. It would be interesting to consider this polity did not prefer practicing cranial modification as did some other sites. Current information on individuals from Tikal may be able to provide new information on why this might have occurred; the founding dynasty at the site of Copan was initiated by a ruler who was considered foreign to the local population living there.

In the Early Classic iconography at Copan dynastic founder, K'inich Yax K'uk Mo is often depicted emulating the Maize God with an ornate headdress and modified crania. According to Schele (1986) and Stuart and Schele (1986), inscriptions found at Copan indicate that K'inich Yax K'uk Mo was a foreigner, and was inaugurated in CE 426. Additionally, the Acropolis, which housed the royal precinct, revealed a tomb that was reminiscent of burial practices from Central Mexico. The primary structure, which was believed to be the ruler's private residence, and which eventually came to house his tomb, was of the talud-tablero style of Central Mexico.

More recent research (Sharer 2003a, 2003b, Stuart 2007, Price et al.2010) suggests that, despite the artifacts and architectural styles, K'inich Yax K'uk Mo was more closely associated with Tikal, rather than Central Mexico. Most recently, Price et al.'s (2010) strontium isotope

analysis strongly suggests this founder's origins as the Maya lowlands, again pointing to Tikal. Therefore, rather than K'inich Yax K'uk Mo utilizing cranial modification in the iconography as a legitimizing force, it might have been the artifacts, architecture, and stylistic influences from Central Mexico were used to reinforce his legitimacy (Sharer 2004). During the excavation of his tomb, Tieler Blos (1998, 1999) confirmed that the individual portrayed the tabular erect variation of cranial modification, as well as both inlays and filling of the dentition, in the fashion of the Maya tradition. Though it is mentioned that the cranial modification is slight, thus this could be an indication that cranial modification at the site of Tikal was not as prominent as it might have been at other Maya localities. Therefore, it could be recommended that additional research be conducted in this area to further support these findings.

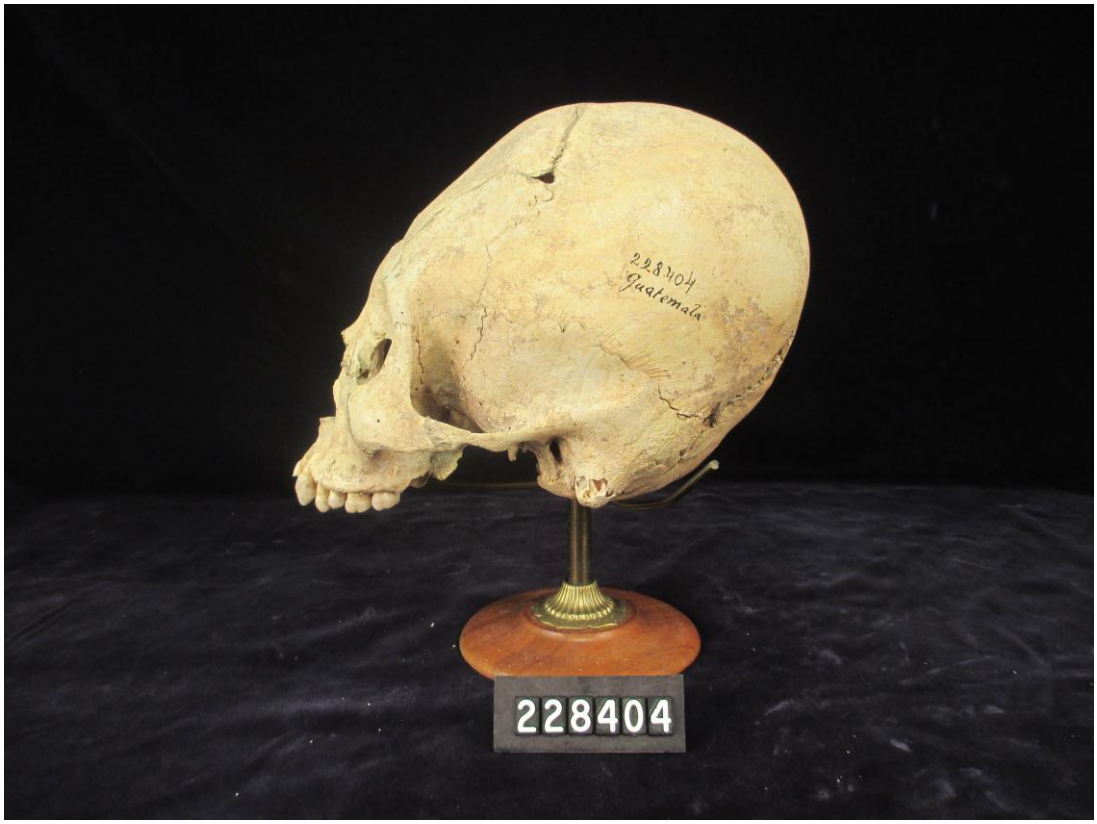


Figure 6.4 Cranium from Guatemala displaying annular variation of modification. Smithsonian Collections *Photo: J.Han*

ANDEAN SOCIETIES

Patterns of cranial modification in the Pachacamac manifest quite differently from those discussed above. However, there is a consistency within this portion of the sample as well. There is an overarching, if not exclusive, pattern of few unintentionally modified individuals and homogeneity between those who are intentionally modified.

The patterns of cranial modification seen in the Andean sample may be explained by the use of the site at Pachacamac. This coastal Andean pilgrimage center was unique in its function, and in that it was utilized for millennia.

Eeckhout (2013), DeMarrais et al. (1996), and Swenson (2012) suggest that the ritual religious processes are evident in the daily life of the Andean population and are present across the social classes. They have proposed that, in order to legitimize control, the symbolic landscape could have been manipulated and exploited by the social elite. However, unlike the Maya example, archaeologists in Peru must rely on the artifacts and iconography to understand the history of Pachacamac. Excavations at this site have revealed extensive information about both religious and secular activities. There have been both temples for the religious as well as buildings designed for other functions, such as residences, storage, defense, and other administrative uses. (Eeckhout 2013).

The construction of so many buildings would indicate the population of Pachacamac would have included a large labor force; a population which would have been supportive of both the religious and the secular. This may be an indication of what can be expected of the data from Pachacamac. With such a labor force, it would appear that the burial population would be largely derived of the local population, and would seem unlikely that the labor would have been produced by a large foreign population. Therefore, if the labor population was made

up from the locals, then one could expect to find a large extent of homogeneity in the cranial modification practices.

Interestingly, Pachacamac is unlike most urban sites in the Pre-Columbian world. It was continuously and seamlessly in use for a thousand years. During this time period, there were at least four distinct cultures that utilized the site, ranging from 200 BCE through to the Spanish Conquest (Eeckhout 2013). It was only during the last ruling culture, the Inka, that we have ethnohistorical accounts that indicate Pachacamac was a large pilgrimage site.

During these changing cultures, many changes are seen at the site of Pachacamac. There have been architectural modifications which include the addition of administrative structures and temples, there are changes in the art, iconography, and in burial practices. However, there appear to be no changes in the practice of cranial modification. While there is little known about the cultures that proceeded the Inka, Eeckhout (2013) indicates that evidence at Pachacamac points to large and measured changes to the architecture for military and social sovereignty. However, the Inka Empire made very few, if any, changes to the spiritual and ritual jurisdiction. This may have indicated that the Inka had more interest in this site for the spiritual and ritual aspects, and less for military defense that a coastal site would provide. Emile Durkheim (1965 [1912]) suggested that large pilgrimage centers, comparable to the site of Pachacamac, that may have been utilized by the ruling classes and the elite as a method of legitimizing their rule through the spiritual and ritual sectors of the empire. If this were the case, it would be understandable that the practice of cranial modification were to remain the same if it were controlled by the religious sectors. The continuation of this practice would have been carried out by the elite, nobles, and rulers as a method of legitimizing their rule, similar to what was happening in the Maya cultures.

Conclusions

Difference in how head shape is used depends on the size and strength of the polity. These results indicate that complex societies had a great influence on a parent's decision to shape their child's head, as well as in the modification technique. Similar to the Maya culture, the Andean sample populations overall maintained a specific form of modification with only slight variations, these variations were due to the type of apparatus used during the modification period. This paper's research suggests complex societies co-opted the body as their own representative, while Andean societies did not impose homogeneity by manipulating the physical bodies of their residents, but rather it was a symbol of unity for the population occupying the coastal region.

CHAPTER 7: Case Studies

In this chapter two case studies more closely examine patterns of cranial modification. They will exemplify the hypotheses concerned with the social complexity examined in the previous chapters to particular portions of the larger sample. Additionally, the two samples will be analyzed in light of specific hypotheses based on the cultural context of these particular sites. This chapter will focus on human skeletal remains from the K'in T'an, elite residences at the Blue Creek site in the Maya region, and at the ceremonial center Pachacamac in the Andean regions.

Case Study I: Maya

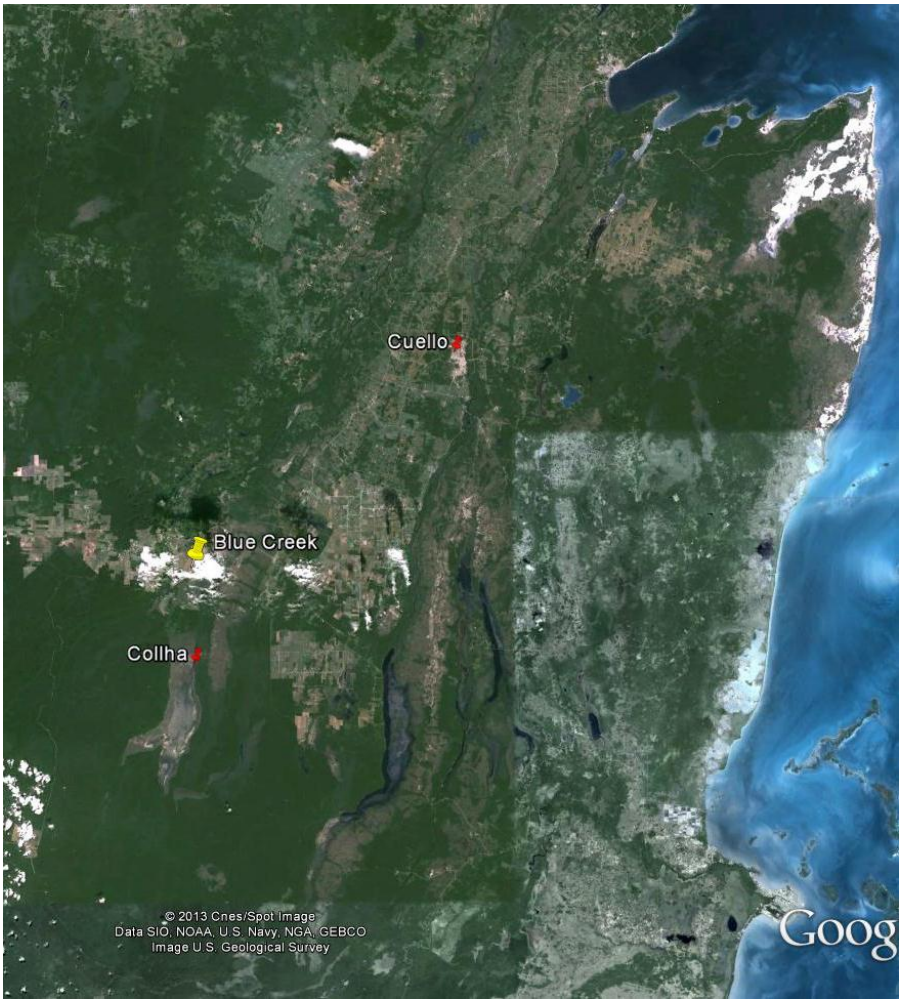


Figure 7.1 Map showing the location of Blue Creek in proximity to Cuello and Colha, in Belize.

At one Maya site, Blue Creek in Belize, the population estimates reached 25,000 during the site's peak during the Early Classic Period. Despite the site's medium size, it grew into a successful urban center with trade and agriculture forming the bases of its wealth (Guderjan 2011). Located in Northwestern Belize, approximately 25 miles southwest of Cuello and 7 miles north of Colha, and, only 42 miles from the coast, this site was a successful trade city. Being within such close distance of these two Maya urban centers, it was likely they would have shared common cultural practices, and, therefore, it would not be surprising to find similar cranial modification variation at all three locations.

This urban site became the Maya area's fifth largest supplier of jade. In addition to jade, the economy at Blue Creek was further strengthened by the presence of rich soils, ideal for agriculture (Guderjan 2011). The site of Blue Creek covers approximately 150 square kilometers, over half of which was used for agriculture.

Being situated at such a critical trade location also helped support Blue Creek economically. Positioned at the terminus of Rio Hondo, canoes would be required to stop and off- load their goods at Blue Creek so that the cargo could be transported further inland to sites like Tikal (Brown 2009).

It was during the Classic Period the city reached its peak. This trade center was able to support several temples, pyramids, places and even a ball court. A central structure, Structure 9, served not only as the primary temple, but also as the *axis mundi*. However, it was during the sixth century that this site witnessed a change in socio-political structure, perhaps as a reflection of larger changes happening throughout the Maya region. It is during this time there was a dramatic decrease in the flow of jade and other imported goods.(Brown 2009).

Also during this period we see K'in T'an, a series of elite residences just west of the site's core, undergo a large construction phase. This is probably due, in part, to the reorganization of the controlling elite. By the Terminal Classic period, the political structure had again changed, and construction activities at K'in T'an had ceased. It was during this period that the site was terminated and abandoned (Brown 2011). Archaeological finds that support this information include large deposits of broken ceramics and other portable objects. These deposits mark the final cultural event.

The site of Blue Creek was chosen as a case study due to the large number of burials discovered there. The city's temporal period ranged from the Early Classic through to the Terminal Classic, also making it an interesting choice. Temporal conditions for the burials that are being studied at this site have not been completed. However, once done, this site will provide abundant information regarding the Maya people who lived in Belize.

It is expected that results from these cemeteries will conform to the general patterns of homogeneity for socially complex societies. Therefore, there should not be diversity in both the presence and type of cranial modification used by these populations, as it most likely was a sign of identity for the entire group. A sizeable portion of the population should display indications of the practice of cranial modification.

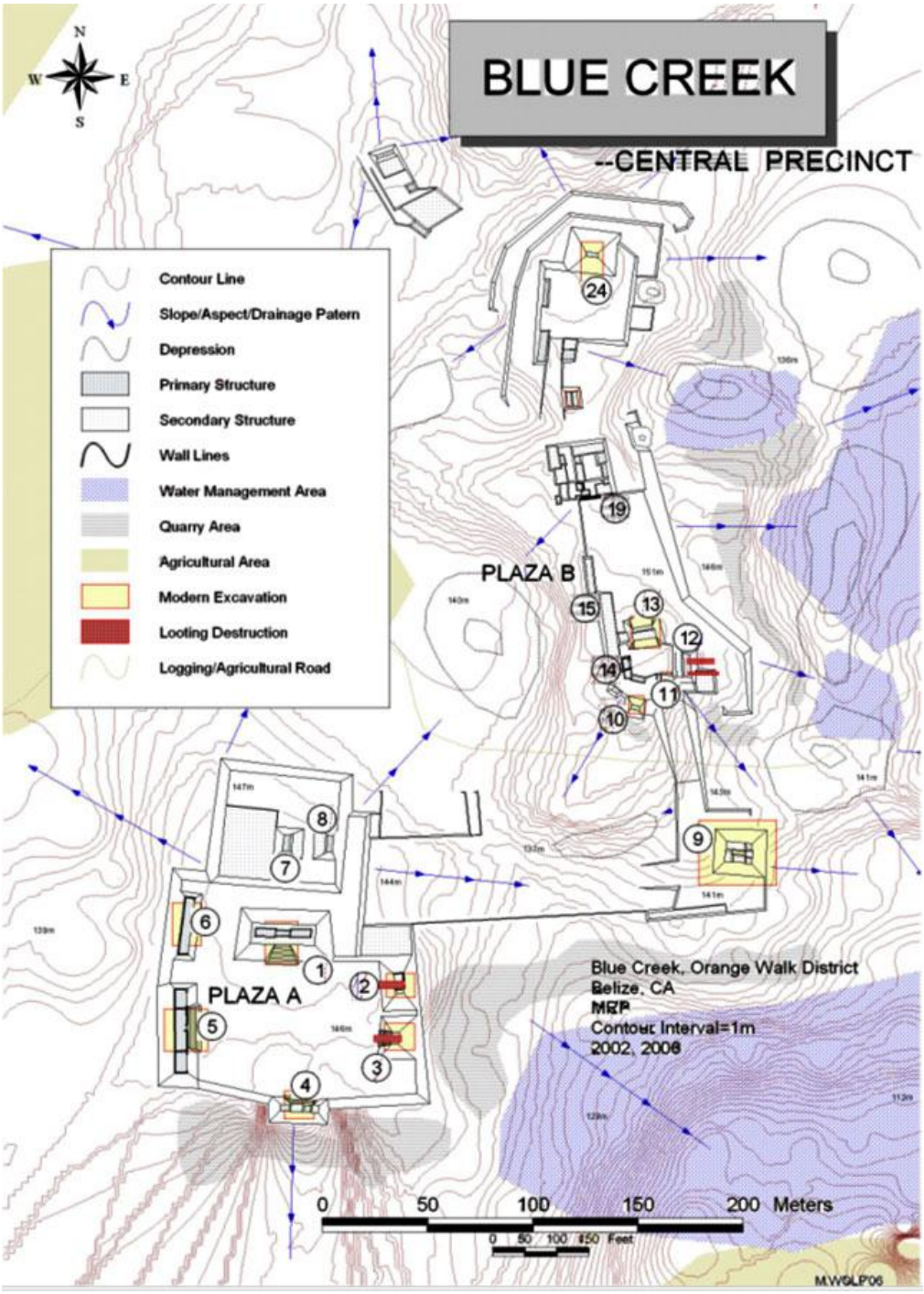


Figure 7.2 This site map identifies all the structures located within the primary urban site, each circled number is the structure number. Structure 8 and Structure 7 are located at the ball court. Structure 9, was the primary pyramid for this site and served as the *axis mundi* for the entire site. Structure 1 was razed during the Late Classic and rebuilt as a tomb for an important member of Blue Creek society.

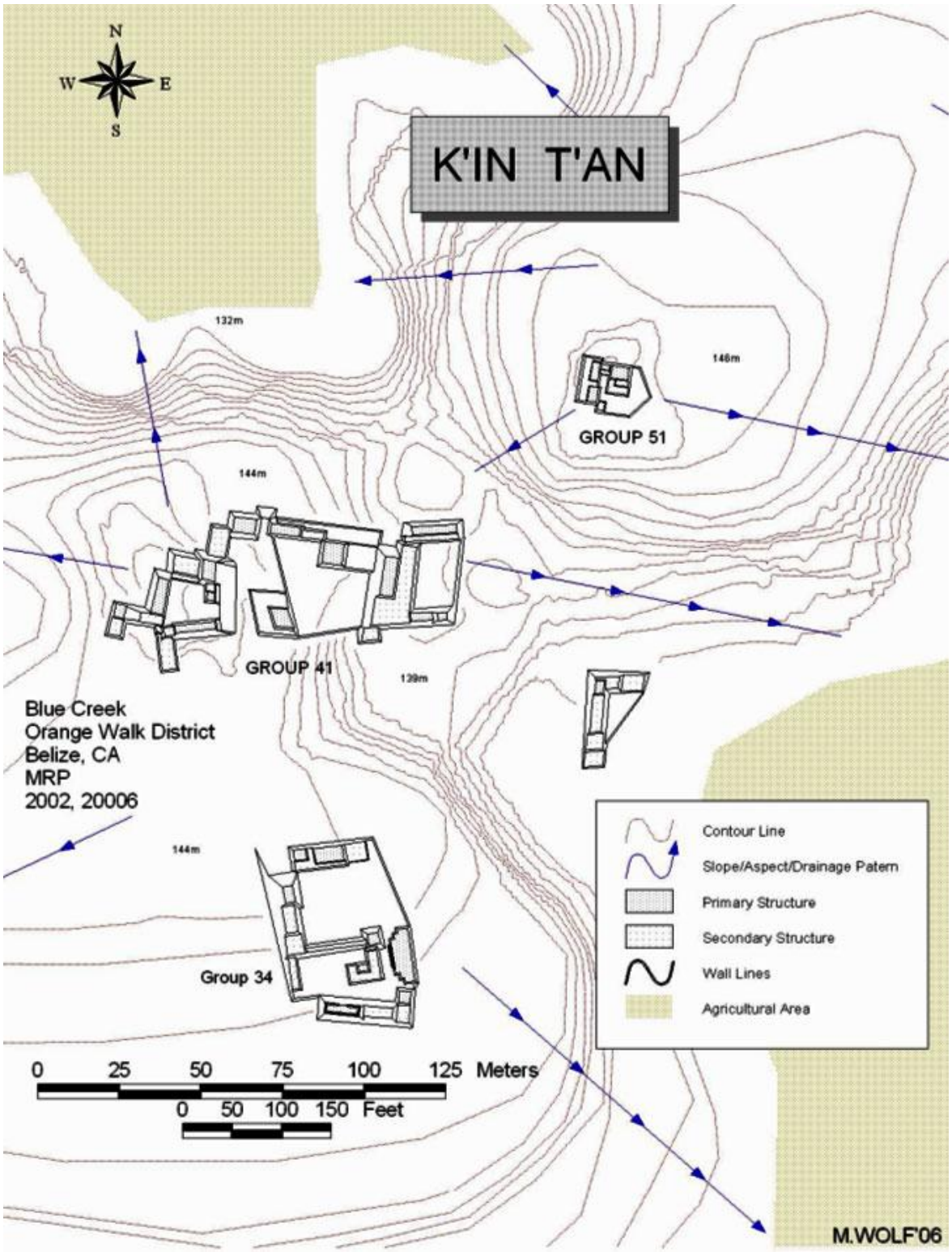


Figure 7.3 This is a site map for the K'in T'an area located just west of the central urban area of Blue Creek

Sample

For the last 25 years excavations at Nojol Nah and K'in T'an at the Blue Creek site in Belize have been ongoing. Archaeologists at this site have excavated 63 burials (males = 17, females = 20, unkown = 22 and subadult = 10) thus far. From the adults, it was determined 45 (male s= 13, females= 12, unkown= 20) did not demonstrate any form of cranial modification, and 15 (males = 5, females = 8, unkown = 2) presented some form of cranial modification. Of the subadults, none presented any type of cranial modificaiton.

This site is currently being excavated by archaeologists Guderjan and Hanratty, along with bioarchaeologists William Brown. Located in Belize, this ancient Maya site has yielded several intact burials in elite residences. The picture that researchers are developing of ancient Blue Creek suggests it was a significant Maya site. Blue Creek might also point to the complexity of the collapse of the ancient Maya civilization. For instance, while the main plaza at the center of Blue Creek was abandoned roughly between CE 830 and 1100, Chum Balam-Nal and other sites nearby may have survived longer, by another generation or so. That might mean these areas allied themselves with outsiders as the ancient Maya culture was collapsing. (William Brown, personal communication 2013)

It is possible that there is a high incidence of non-modified crania at this site because they were aligning themselves with outsiders before the site was abandoned. As previously stated at this time the temporal information is not available for the burials and the preservation in these areas is rather poor. At the other sites around the Maya region the difference between modified and non-modified crania is much lower. Tiesler's study, in fact, actually demonstrated quite the opposite of what is being seen at the site of K'in T'an.

For the purpose of this project there were six age categories defined as set by bioarchaeologist William Brown for the analysis of the remains recovered from K'in Tan. Brown used the perimeters as established by Brooks and Suchey (1990), Buikstra and Ubelaker (1994), Krogman and Işcan (1986), Saul and Saul (1991), and White and Folkens (2000).The six categories as defined are as follows: Infant (0-3 years of age), child (3-12 years of age), adolescent (12-20 years of age), young adult (20-35 years of age), middle adult (35-50 years of age), and old adult (50+ years of age).

For this burial population there was estimation on stature. For the purpose of this project, Brown's (2011) proposed estimations were used. Brown (2011) used the regression formulae for Mexican males as established by Trotter (1970). These formulae generally have an error range thus there was both a minimum height and a maximum height estimate provided. For the purpose of this project, the minimum height and maximum height were averaged for calculation purposes. When calculating an estimated stature, generally more proximal elements are more reliable (Jantz and Jantz 1999). In classification of culturally modified detention, the Molina system was employed (Romero Molina 1970).

Figure 7.4 Burial 54 at Nojol Nah Blue Creek, Belize *source: William Brown*.

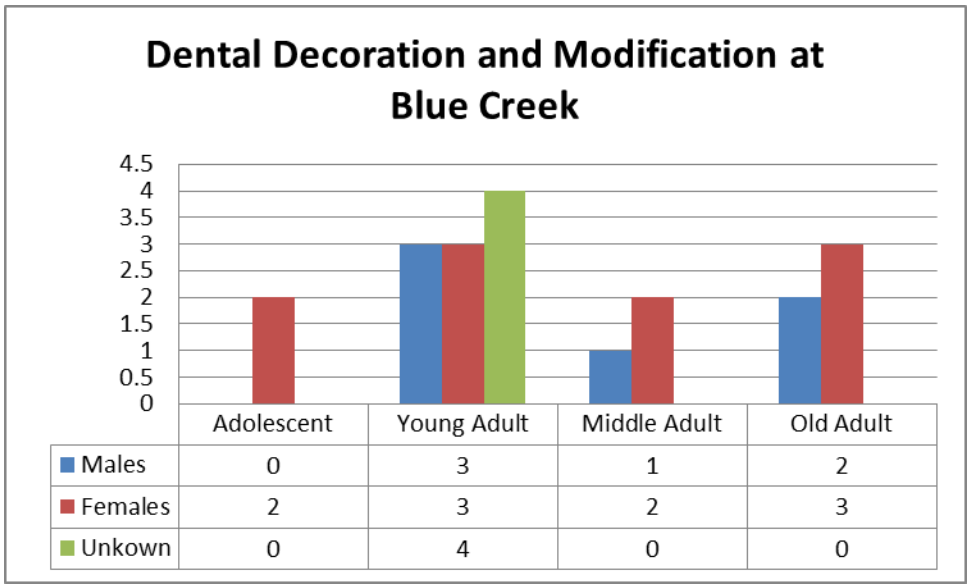
Bioarchaeological Hypotheses

It is expected that the results from these cemeteries will conform to the general patterns of the Maya discussed earlier in this paper. There should not be a large amount of diversity in either presence or type of cranial modification used by these populations, as it most likely was a sign of identity for the entire group, and we should not expect to see a sizable portion of the population that does not display cranial modification.

As previously discussed, the Maya were a highly complex society with a variety of hierarchical levels. Developing a method for determining where an individual was positioned on this social scale has been a challenge for researchers and archaeologists. Burial location and mortuary items can also help in interpretations, occasionally, there are burials surrounded by artifacts that provide a clear indication of an individual's social status. With the participation of bioarchaeologists other clues can be used to suggest status.

Stature, nutritional health, and other forms of body adornment such as dental decoration found in the burial population. Gellar (2006) observed modified detention in the residences of both the elite and commoners. After analyzing over 132 individuals spanning a time frame stretching from the Late Preclassic through the Terminal Classic, she concluded that sex was not a factor in the presence of dental modification. Gellar (2006) examined individuals from all levels of the social hierarchy from the farmer to the ruler, and provided some very interesting theories.

Gellar (2006) notes that individuals with notched lateral incisors were most likely "distinct and perhaps central figures within their communities" (Gellar 2006:287). However, she further noted that only elite males at Chan Chich and Dos Hombres presented Romero Molina type E1 modifications, which are inlays in the maxillary teeth.



	Adolescent	Young Adult	Middle Adult	Old Adult
Males	0	3	1	2
Females	2	3	2	3
Unkown	0	4	0	0

Chart 7.1 Distribution of Dental Decoration at Blue Creek

From this analysis, Gellar (2006) concludes that dental modification may have been a sequential process. She notes that dental modification may be associated with distinct events when an individual reached a new elevation in status. Gellar (2006:287) states:

> "It is possible that addition of designs to a previously modified tooth signified promotion from one political or religious office to a more prestigious position. Sustenance of painful procedures, not once but twice, perhaps stressed the modified individuals worthiness, as evidenced by the occupant interred within the Chan Chich tomb…Sharing of stylistic types by these individuals perhaps signal a specific, restricted kind of identity, likely related to rulership and/or socio-religious prominence. Moreover, it is possible that females were excluded from such identity constitution, seeing that individuals displaying these distinctive types were lames or possible males. Finally, specific dental types displayed by PfB's individuals may have linked them with similarly decorated and powerful others, at spatially distinct centers, such as Copan, Tikal, Nakbe, and Lubaantun"

Results

All of the crania from the Blue Creek site were examined for presence and type of cranial modification.

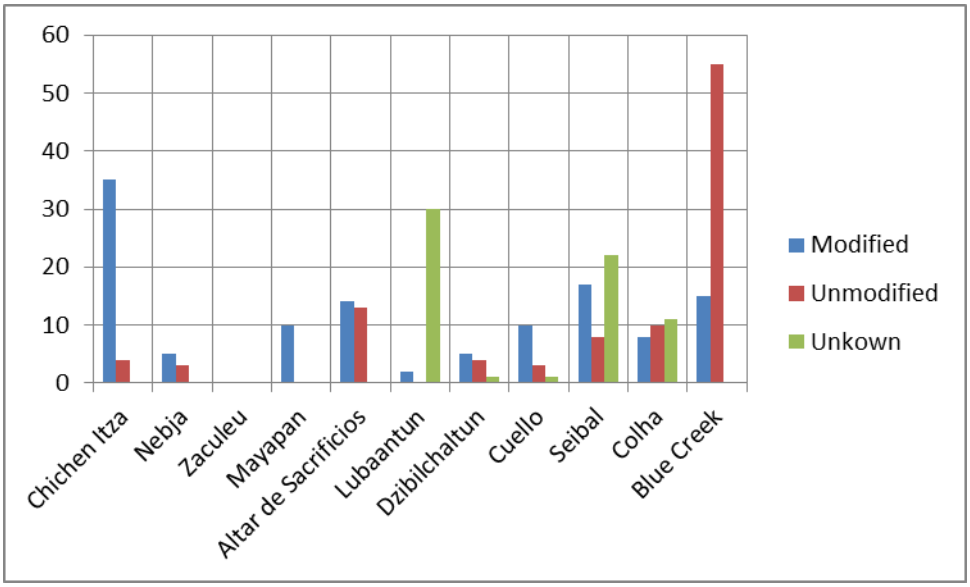


Chart 7.2 Distribution of cranial modification from all sites.

The results were surprising in accordance with previous work on the crania from the Maya region. The Blue Creek site actually had the largest number of crania available with which to work. For the modified crania, there was a slight difference in modification variations. Some crania appeared to exhibit the tabular erect variety of modification. However, a few crania that presented modification strictly in the frontal or the occipital.

Distribution of Modification as seen at Blue Creek

Blue Creek	Tabular Erect	Frontal or Occipital Only	No modification
Males	4	1	13
Females	3	5	12
Subadults	0	0	10
Unkown	2	0	20
Total	**9**	**6**	**55**

Table 7.1 Cranial modification by *sex Source:* William Brown Bioarchaeologist, Personal communication 2013

Careful analysis demonstrates that there is a large number (n=55 or 78%; Table 7.1) of unmodified crania found at the site of Blue Creek. Therefore, the possibility should be considered that a large number of outsiders may have lived within this community.

As was previously discussed, the site of Blue Creek was located at an important position for trading. Sitting at the terminus of the Rio Hondo, many traders would have completed their journey at this urban city, and, thus, was an important location along the Maya trade routes. Considering, then, the possibility that a large number of traders chose to live at the site of Blue Creek, it is important to consider they may have come from inland or other coastal areas. It is now believed that Maya traders would circumnavigate the Yucatan Peninsula and penetrate the interior areas via the rivers.

In their research regarding trading ports, Healy et at (1984) concluded that obsidian was actually coming from the interior of the Maya region and being transported to the east and north. If this was the general trade route, then traders influencing the locals seem somewhat less likely. Rather, it appears that the Maya cranial modification would have been a state or religiously controlled practice. As has been previously discussed, there have been many images and artistic renderings of the Maize God. This deity was the primary god of the Maya pantheon.

The origins of the Maize God are debated, although several theories are associated with the Maya creation myths. According to Maya archaeologists Taube (2009) and Coe the Maize God was the resurrected father of the Hero Twins in the creation myth of the Popol Vuh. Within this myth, the Hero Twins have alter egos that are constructed of maize, as well as the creation of man, himself from the maize plant.

An alternate theory from archaeologists Friedel and Schele is that the Maize God is centered more within the cosmology as interpreted by the Maya culture. Within this theory,

they combine the three stone hearth with constellations and incorporates the 'World Tree', which is often seen in Maya iconography.

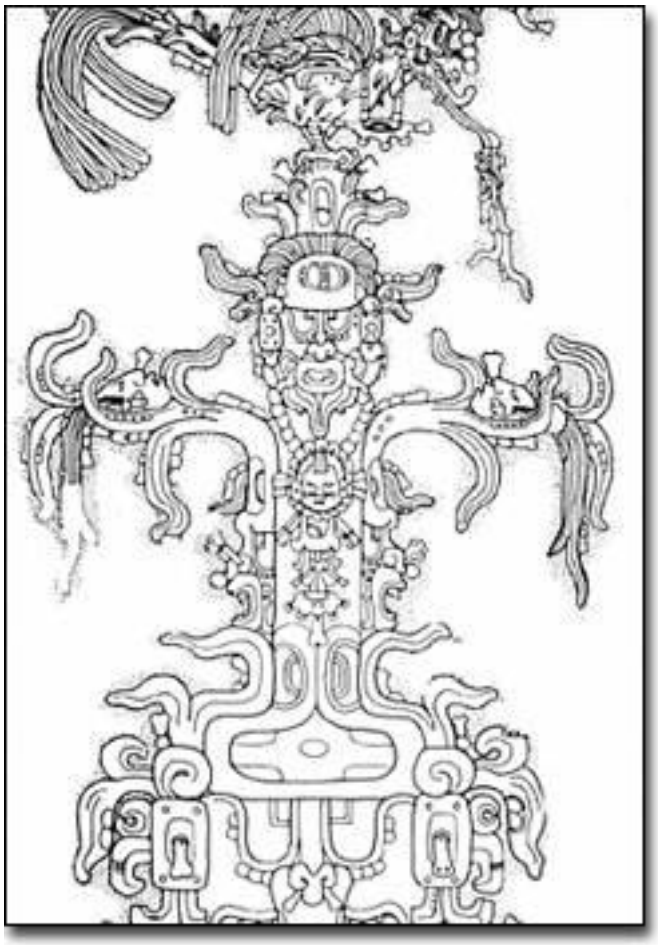


Figure 7.5 World Tree from the panel of the Foliated Cross, Palenque *Source: Linda Schele Collection.*

Both of these Maize God theories place him as the most important deity in the Maya Pantheon. Therefore, indications that the practice of modifying the crania as part of Maya religion honoring the Maize God would be expected throughout the region. However, discovery of sites like Blue Creek and Collha, where there are less instances of cranial modification in the archaeological record, contradicts this idea. If the Maya were not operating as a unified empire, but rather as city states, it is plausible the practice of religion was more unique to each individual city state. Through trade they would have shared the same cultural customs, but each

individual city state would have been able to place emphasis on which customs were more prevalent than others, and, it is possible that at Blue Creek cranial modification was simply not as important.

Presence and type of cranial modification

About 23% of the population displayed forms of cranial modification across this site and time periods. Type is also consistent within this site. The majority of the modified individuals fall within the tabular category, and more specifically, are classed as tabular erect.

Distribution of Cranial Modification, Age and Sex at Blue Creek.

Burial	Sex	Age	Cranial Modifiation
4	Female	Old Adult	Tabular Erect
7	Male	Middle Adult	Tabular Erect
9	Male	Old Adult	Tabular Erect
12A	Male	Middle Adult	Tabular Erect
13	Female	Young Adult	Frontal Flattening
15B	Female	Adolescent-Young Adult	Frontal Flattening
18	Male	Old Adult	Tabular Erect
21A	?	Young Adult	Tabular Erect
22	Female	Young Adult	Occipital Flattening
24	?	Young Adult	Tabular Erect
31	Female	Adolescent – Young Adult	Occipital Flattening
41	Male	Young Adult	Frontal Flattening
49	Female	Middle Adult	Frontal Flattening
52	Female	Young Adult	Frontal Flattening
54	Female	Young Adult	Tabular Erect

Table 7.2 Detail of burials with cranial modification at Blue Creek. Source: *William Brown Bioarchaeologist, Maya Research Program*

Temporal Changes and Sex

Stewart (1975) acknowledges a spatial and temporal pattern to the distribution of cranial variation in an overview of modification in the Maya area. Stewart states that during the Late Classic and Postclassic Periods, the tabular oblique variation was predominant. He further notes that tabular oblique appears most often during the Early and Late Classic periods at Zaculeu, and that tabular erect only appears during the Postclassic Period at the site.

Saul (1975) concurs with the earlier finding by Stewart that the tabular oblique variety was dominant through the Late Classic. Saul (1972) asserts that, additionally there may have been a divide between the sexes with regard to cranial modification. During the Late Classic, the tabular oblique style was seen in both male and female crania. However, by the Postclassic Period, only female crania showed traits of tabular oblique and only male crania showed tabular erect.

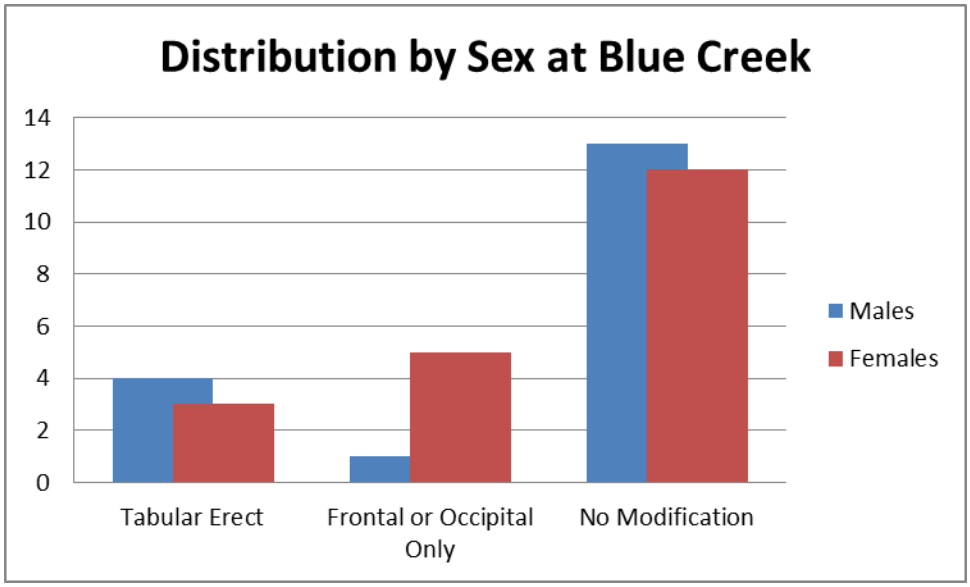


Chart 7.3 Based on information provided by William Brown.

Evaluation of the crania from these sites does seem to indicate that, during the Classic period, there was a preference for the tabular oblique variation of cranial modification. However, it does not appear that during the Postclassic there was an exclusivity of tabular oblique to females and tabular erect to males. Both sexes continued to practice both variations of cranial modification.

These temporal changes were noted in both the broad category of modification as well as in the specific type. Individual sites were examined for sex differences in cranial modification practices. There were no significant differences between the sexes in either presence or type of

cranial modification in the Maya regions. Although the evidence does seem to support the findings that male did not practice tabular oblique cranial modification during the Postclassic, it is important to remember that, for the purpose of this project,the sample size was quite small. Therefore, it could be recommended that additional research be conducted in this area to further support these findings.

Paleopathology

There are several pathologies observed in this burial population. However for the purpose of this project, there will be a focus on two that can reveal a great deal of information about social status. First is arthritis/degenerative joint disease (DJD). There have been over 200 different types of arthritis identified (Lovell 2000:219). One of the most common and frequently occurring forms is osteoarthritis. This particular form of arthritis entails the destruction of articular cartilage in joints and the formation of new bone adjacent to what was destroyed. These spurs, or lipping, often form around the rim of a joint (White and Folkens 2000:398).

This form of arthritis is often directly related to both the type and intensity of activities an individual was involved in. Likewise, osteoarthritis can be used to evaluate community based activities. Bony spurs, which protrude from the vertebral body, create a shelf-like rim around the superior and inferior edges of the vertebrae. According to Buikstra and Ubelaker (1994) and White and Folkens (2000), the formation of these enthesophytes/osteophytes are a result of age and activities that are cause the degeneration of the intervertebral disks. However, it is important to note that the presence of these osteophytes is not a direct indicator of osteoarthritis, since these formations are also related to trauma, habitual stress, and infectious pathologies. Roberts and Manchester (1995) have described osteoarthritis as "…multifactorial in its aetiology. Increasing age, a genetic predisposition, obesity (leading to stress on the joints),

activity/lifestyle, and environmental factors such as climate may all contribute to its development" (Roberts and Manchester 1995:106).

The second pathological condition which can be an indicator of the level of stress the Blue Creek burial population experienced is porotic hyperostosis. A variety of conditions that can arise if the blood supply to the skeletal system is disrupted by trauma and hypervscularization, causing remodeling of the bone tissue (White and Folken 2000:394). Typically, porotic hyperostosis presents in a symmetrical, bilateral distribution, leaving evidence concentrated on the parietals and the roofs of the eye orbits (White and Folkens 2000:394). While the causes of porotic hyperostosis have been widely debated, the most commonly agreed upon cause has been attributed to iron deficiency or other anemias. This is seen quite often in communities with maize -based diet (Scherer et al. 2007:85).

In the Blue Creek sample, there were eight individuals who displayed osteophytic lipping and 3 individuals who presented evidence of porotic hyperostosis. Although the sample size for this project is small, with only 63 burials, these minute numbers indicate that this community was in overall relatively good health (Brown 2011:56).

As a member of the elite population, circumstances would indicate that an individual would have more access to resources required for good nutrition. Considering this, remains can be examined more closely for indication of better health, the realization of full growth potential in stature.

Of the 63 burials that have been excavated at Blue Creek, 10 of those were complete enough to determine an approximate stature. If the stature is examined against the burials that also exhibited cranial modification, it could be determined whether cranial modification

practices were associated with 'taller' individuals, and provide an indication link between cranial modification and the social elite.

Burial	Sex	Age	Pathology	Cranial Modification	Dental Modification
4	Female	Old Adult	Osteophyte Lipping	X	-
7	Male	Middle Adult	Osteophyte Lippoing	X	X
9	Male	Old Adult	Osteophyte Lipping	X	X
11	-	Adolescent	Porotic Hyperostosis	-	-
12A	Male	Middle Adult	Osteophyte Lipping	X	-
21A	-	Young Adult	Osteophyte Lipping	X	X
28	Female	Old Adult	Osteophyte Lipping	-	-
30	Male	Old Adult	Osteophyte Lipping	-	-
38	Male	Young Adult	Porotic Hyperostosis	-	X
46	Male	Old Adult	Osteophyte Lipping	-	-

Table 7.3 Burial distribution of dental modification and cranial modification *Source: William Brown data from Blue Creek*

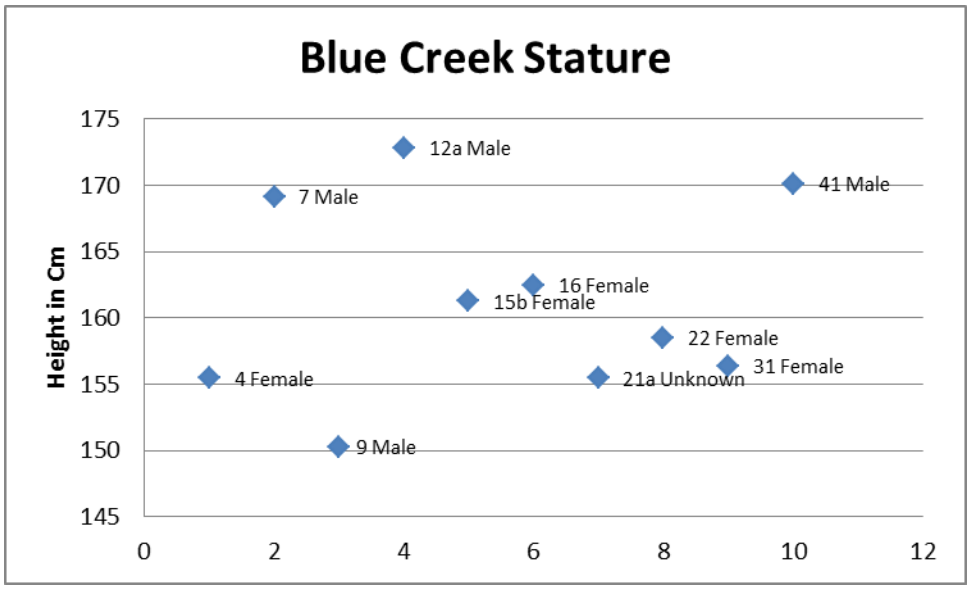


Chart 7.4 Burial population stature.

Information regarding these burials indicates that all but one individual presented cranial modification. Burial number 16, which is a middle adult female, did not present cranial modification; this burial did, however, have dental modification present.

Archaeology & Context of Burials

The burials at Blue Creek have been found in four distinct locations within the elite structures at K'in T'an: the floor, benches, construction fill and crypts. It was Saxe (1970) that originally suggested burial practices were indicative of developing linkage between people and places. Despite this initiative over 40 years ago, there has been very little impact on Maya mortuary studies. Within the realm of ancestor venerations, most researchers seem to focus on the elite, as it has been seen that commoners did not participate in this activity. However, more recently, new research has suggested the possibility that non-elite ancestor veneration was overlooked, or dismissed, due to the numerous burials located within the residential structure rather than an elaborate pyramid (McAnahy 1995:483).

McAnany (1995) suggested that these internments were frequently dismissed during excavations. However, they should be more carefully considered. She proposes that internments of this nature are more likely to be venerated "in name because particular resources rights and obligations were inherited through them by their decedents" (McAnany 1995:483). This is further perpetuated by the comment that this is why internments were located within the residence; they "slept" there so that there was no break between the generational claim to the resource (McAnay 1995).

At the site of K'in T'an in Blue Creek, 45 of the burials noted were located within the residence, thus indicating that there was a form of ancestor veneration or connection to the resource.

Burial Location	Number of Burials	Number with Cranial Modification	Number with Burial Goods	Males	Females
Under Floor	18	7	9	3	7
Under Bench	12	4	3	5	2
Construction Fill	10	-	3	2	3
Crypt	5	-	3	1	2
TOTAL =	***45***	***11***	***18***	***11***	***14***

Table 7.4 Burial location and mortuary artifact distribution.

It is interesting to note from this information that not all of the burials included grave goods, and that not all had cranial modification. One possible explanation for the lack of cranial modification is that the temporal period with which the graves are associated may have been a period where the Maya region was in a decline, with more outsiders intruding into the area,or a relaxation of the ideology behind the social constructs regarding cranial modfication.

Out of the 63 (with context = 45) that have been excavated at this site, 18 of them included mortuary artifacts. In Maya society if was common to place jade artifacts with persons of great importance when they are interred. Since these burials are located in the elite residences found at K'in T'an, it is expected for a significant number of them to have included jade artifacts. It is surprising, then, to discover that only four of these 18 burials contained jade artifacts.

There were 13 (males=5 female = 6 unknown = 2) individuals which present both cranial modification and a burial location. Under the floor were seven (males = 2, females= 3, unknown = 2), under benches were four (males = 2, females = 2), and in an unknown local were two (males =1, females =1).

If only burials with cranial modification were examined for location, it would appear that the majority of these individuals were interred under the floor. However, there is one female which was buried under a bench.

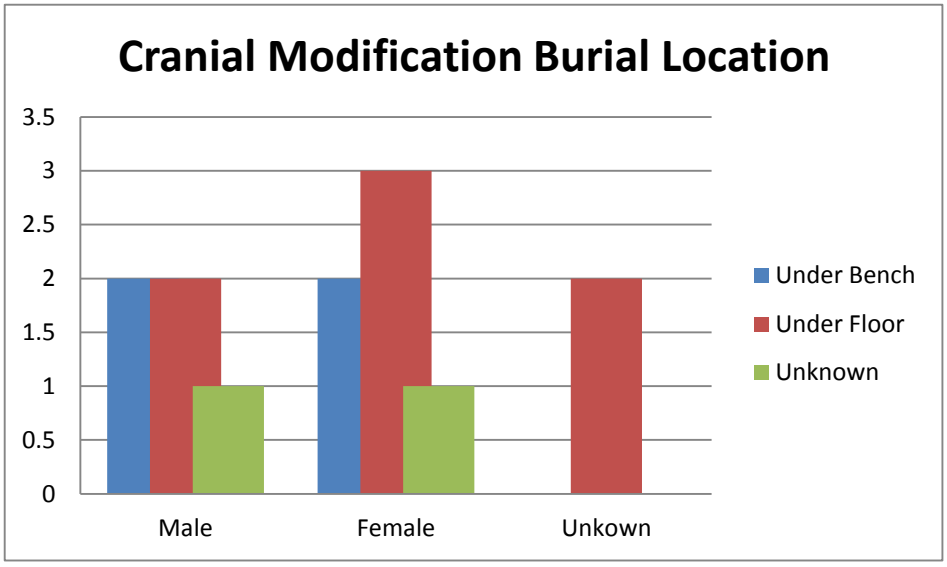


Chart 7.5 Distribution of cranial modification and burial location.

This is interesting in light of what was presented earlier regarding the internment of ancestors, and that none of the modified crania are present in either the crypt location or the construction fill. It is possible that these individuals are actually from the earliest periods at the site. As stated previously, it was during the sixth century that there was a large construction phase at the elite residences. Since none of the modified crania were present in construction fill, it is possible that they were already in place before this phase of construction at the site.

If we examine the table 7.5, we can see that only one modified cranium was present in an older adult. The others were all middle or young adults. This might indicate that, combined with dental modification and mortuary items, this person was of significant importance in this community. However, we also can see that he was buried under the floor of the residence. This would suggest that even people of importance were placed within the residence.

The climate and soil conditions in these areas do not provide ideal preservation conditions as in contrast to other areas of the world that are arid and dry. Many of the

excavated remains were fragmented or missing; some individuals were identified from a single bone. This would mean that the sample is skewed.

One example of this is Burial 47. This individual was located in a burial pit of construction fill during the final phase of construction for structure 4D2. The bones were disarticulated, indicating it was a secondary burial location. This is also indicated by the lack of teeth and smaller elements.

For the elements recovered, there were 31 small crania fragments, approximately 20% of the mandible, four vertebral process, one ilium fragments and 18 rib fragments. From the remains of this particular burial, it can be understood how little is found in most burials for archaeologists to analyze.

Secondary burials at this site appear to be common. As previously discussed, burials located within a residence could be an indication of legitimizing a particular resource for families. Secondary burials could indicate that an individual was moved from one resource to a newly constructed resource if, for instance, the family's social status had changed. There is also a possibility that a change in status for the family could mean that a burial is moved from the outside of a resource into the inside order to procure the newly found status.

Burial & Age	Burial Location	Cranial Modification	Male	Female	Mortuary Item
6 Child	Under Floor	-	-	-	Jade (1), Obsidian(1)
8 Child	Under Floor	-	-	-	Obsidian (1)
9 Old Adult	Under Floor	X	X	-	Mother of Pearl Star
12a Middle Adult	Under Bench	X	X	-	Pendants (2), Obsidian (2) Headstones (2)
12b Child	Under Bench	-	-	-	Worked Sherd (1), Perforated Dog Tooth (1)
14 Young Adult	Under Bench	-	-	-	Concentration of sherd on floor above burial
17 Middle Adult	Intrudes Floor	-	X	-	Upright Slab
18 Middle Adult	Intrudes Floor	X	X	-	Upright Slab
21b Old Adult	Under Floor	-	-	X	Obsidian (1)
22 Young Adult	Under Floor	X	-	X	Spindle Whorl (1)
24 Young Adult	Under Floor	X	-	X	Point of Bone Needle
29 Old Adult	Construction Fill	-	X	-	Jade (1), Mother of Pearl Fragments, Olivella Bead (1)
31 Young Adult	Under Floor	X	-	X	Three upright Slabs
33 Young Adult	Construction Fill	-	-	-	Chilar fluted cylinder jar
35 Old Adult	Crypt	-	-	X	Jade (2), Worked Sherd (1), Painted Wall Plaster
36 Young Adult	Crypt	-	-	X	Mano Fragment
44 Young Adult	Crypt	-	-	-	Mano Fragment
45 Middle Adult	Construction Fill	-	X	-	Jade Earspool

Table 7.5 Detailed information from burials presenting cranial modification. Based on information provided by William Brown

Discussion

The original hypothesis put forward was that the Maya site at Blue Creek there would be a level of homogeneity based on previous socially complex societies. It was theorized that, in Maya culture, cranial modification was of a ubiquitous nature, and, performed as part of the ethnic identity, cranial modification would have been practiced universally.

While it is apparent that cranial modification was practiced in the Maya region, the number of individuals who participated in the practice of cranial modification was not as high as had been anticipated. Only the work done by Teisler (1994, 1998, 1999a,b, and 2001) appears to have a larger number of modified crania than unmodified (n = 740, with 594 displaying cranial modification, and 83 considered unmodified, 63 were declared unknown). This would call into question the theory that cranial modification was considered a Maya concept or if it was a practice that was reserved for a specific population of people , such as the elites or priests.

Finally, because of this site's central trade location, it was hypothesized there could be a large number of crania that present a variety of cranial modification types, or even a lack of modification present. This was theorized on the bases that Blue Creek was situated at an important universal trade location, and, therefore, would have had foreigners traveling through or residing at this urban center. Although the site of Blue Creek was a central trade location, it was a Maya trade route, the likelihood that outsiders would have utilized this site for the purpose of trade was not high.

Foreigners residing at this site might also explain the numerous socio-political changes and construction phases. The understanding of the interrelationships between individuals as to who had access to imports and luxury items is a crucial element to understanding socio-political organization within the Maya culture (Rathje 1970). If the control of luxury goods changed, so would then the socio-political control; thus the reconstruction phases and exchanges of power which were seen in the archaeological evidence at Blue Creek. However, after considerable analysis, it would appear that Blue Creek was a trade center located in the heart of the Maya region. It was situated between two other sites, Calhou and Callo, that were previously mentioned.

According to Guderjan (2004), Blue Creek was a thriving urban peripheral site during the Early Classic Period. However, around CE 500, this changed dramatically. The cause of these drastic changes is unknown, but this marked a turning point in the site's history. During the Late Classic Period, this urban center continued to see growth and expansion, especially within some of the elite residences at K'in T'an. While the economy continued to thrive, the jade production ceased to exist (Gunderjan 2004). The disappearance of jade at Blue Creek appeared to reflect a broader regional pattern with the decline of jade at many of the Late Classic sites (Rathje 1970).

Temporal Changes

As previously mentioned, this particular site was in use from Preclassic periods until the Terminal Classic period. Unfortunately, the sample does not have temporal information for the burials; therefore, the only conclusive information indicates that the burials were made during the occupation periods for this site. This is concluded based on the information for where the burials were located within the residential structures.

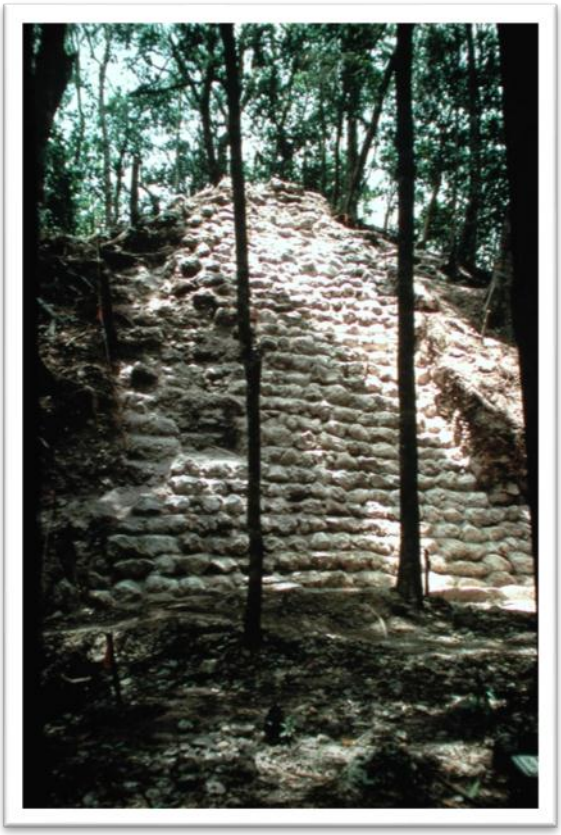


Figure 7.6 Structure 9 at Blue Creek Belize source: William Brown

Conclusion

This chapter detailed cranial modification practices in Maya society. The high quality archaeological research conducted for decades in this area allowed for a large sample with tremendous temporal depth to be examined in this research. The results of this data indicate that, although cranial modification was practiced at Blue Creek, there do not appear to be enough intact crania to conclude that cranial modification was practiced by the entire population.

If the entire population were healthy, it could be assumed this community was reaching full growth potential. This information, combined with the high instances of dental modification and the communities' proximity to the site's core, all indicate this was a community of elite residences. The concerns brought forward due to burial location and relatively few mortuary

artifacts, especially for what was considered such a wealthy site, may be contributed to the theory of ancestor veneration and tying the resource to a name.

This only leaves the concern of why there is a high instance of unmodified crania. Early in this thesis it was posited that one hypothesis could be a large population of foreigners living in this urban center. However, if one considers the distance that would need to be covered for a population outside of the Maya influence to reach Blue Creek this theory becomes less probable.

Although Blue Creek was an important trading center, the large capital city of Tikal was situated less than 70 miles from the site. If foreigners had settled this region, it is likely they would have conformed to Maya culture very quickly, especially considering this population represents a community of elites.

Case Study II: Pachacamac

Pachacamac functioned as the paramount Andean religious and pilgrimage center for nearly a millennium (Bauer and Stanish 2001:10-12, Bruhns 1994:251, Eeckhout 1999, Uhle 1903). It is located approximately thirty kilometers south of Lima, Peru, on the shore of the Pacific Ocean, just north of the Lurin River (Figure 7.7). Pachacamac received its name after the Maker of the World, the son of the Sun God. Pachacamac was the god of fire and earthquakes. According to myth, he was responsible for equilibrium in the world. (Ravines 1997:95). Cobo referred to it as a universal sanctuary. “In magnitude, devotion, authority, and richness, the Temple of Pachacama was second only to the magnificent Temple of the Sun” which the Inka had constructed in Cuzco to serve as the center of the empire. (Cobo 1990 [1653]:85).

Pilgrimages to areas of religious importance are a cross-cultural phenomenon; they involve not only the arrival at a place of great importance, but also a journey involving stops at smaller shrines along the way (Turner and Turner 1978:23). Even today, people continue to make pilgrimages all around the world. One example is the pilgrimage that many Catholics make to Sanitago de Compostela. Andean pilgrimages today are often blended with modern Catholic ideals and some traditional Andean notions of pilgrimage, and ritual. As a model for comparison, Silverman has studied the contemporary regional pilgrimage to the sanctuary of the Virgin of the Rosary at Yauca (Silverman 1994). Just as it is believed at Pachacamac, this pilgrimage site was maintained and prepared for by a resident population. During the busy ceremonial times, the city was transformed from the quite, sparsely inhabited area, into a "teeming city and marketplace" (Silverman 1994:11). The effects of bioarchaeological studies of these sites are certainly considered by the notion of both a migrant and standing population. When studying these areas, it is important to consider those buried here may belong to the local population, a priestly group, a pilgrim population or even the possibility that there is a mix of all these populations.

The frequency of events on the ritual calendar will also affect and contribute to the distribution of burials in and around Pachacamac. Due to the site's important role in the pre-Columbian Andes as the paramount pilgrimage center, very large resident population might be discovered in addition to a large population of individuals traveling from distant places in order to participate in ritual activities.

Site History

Pachacamac was occupied from the Middle through Late Horizons (CE 700-1532) (Figure 7.11). According to current research the earliest phases of this site appear to have been of a

ceremonial nature (Eeckhout 199:78). Despite its size and resident population, it does not appear that this site ever functioned as a city outside of the religious role. Researchers now know that what has come to be known as the Old Temple was the first building constructed at the site, near the end of the Early Intermediate Period (200 BCE- CE 700). Although Pachacamac was well known throughout the Andes, it has been discovered that the population responsible for the initial construction was known as the Lima Culture.

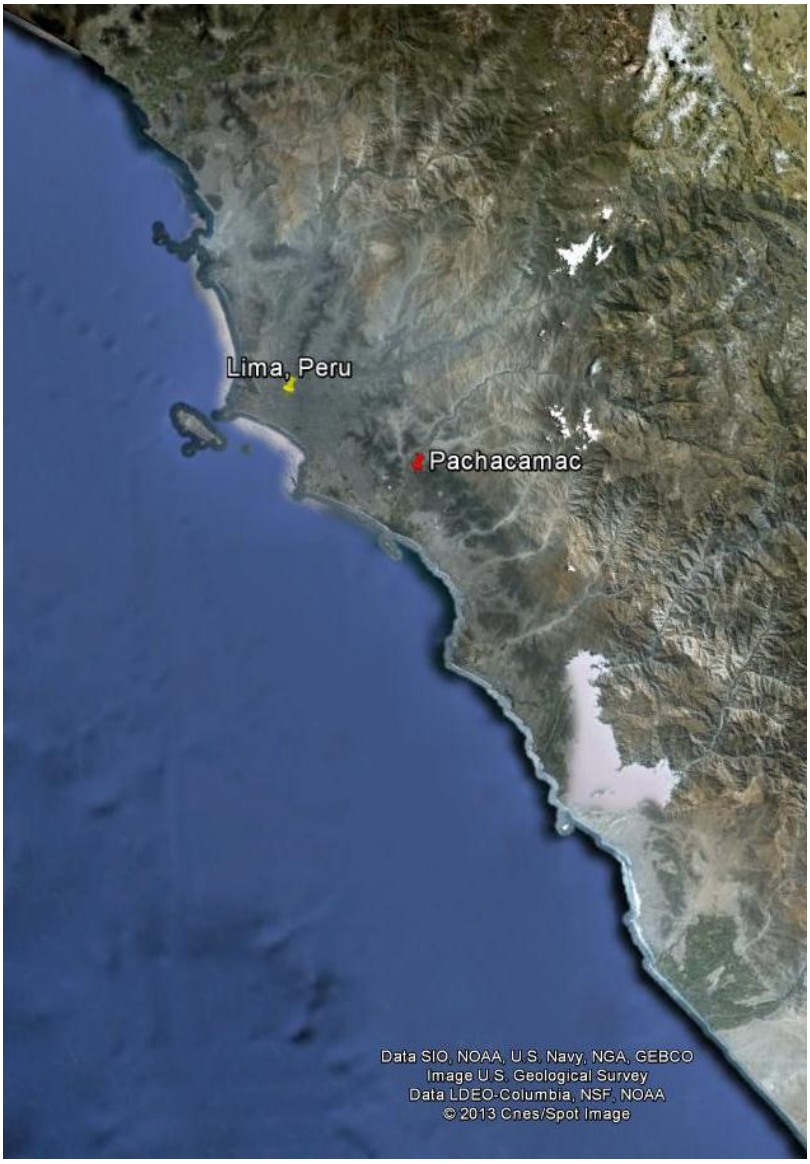


Figure 7.7 Location of Pachacamac and modern day Lima. Source Google Earth.

Evidence has suggested that there was a Wari presence during a Middle Horizon explosion in construction. Max Uhle's excavations at Pachacamac yielded tombs with Wari objects as well as the use of Wari inconography (Eeckhout 1999:84, Uhle 1903). Pachacamac gained importance as an interregional pilgrimage center and subsequently exerted its own power, separating from Wari control (Shimada 1991:il). This was concurrent with the appearance of the idol Pachacamac. The later Middle Horizon saw the movement of people from around Lima, as well as from the higher elevations, to this ceremonial center, and the cooptation of other religious centers as branch oracles (Shimada 1991:1). Eeckhout has stated that, in addition to the people of the Peruvian coasts, there were pilgrims from Colla, Huallas and Huancho areas. The Late Intermediate Period occupation continued to see new construction, including the pyramids with ramps. Although pilgrimages certainly continued, some believe that these temples were built and used for private use by elite families (Eeckhout 1999). A more common belief is these were provincial temples built by representatives of distant groups and were used to maintain the ideology (Jimenez Borja and Bueno Mendoza 1970).

Figure 7.8 House of the Chosen Women, Pachacamac Peru *courtesy of TrekEarth*

By the Late Horizon Period, the Inka Empire began to make an appearance, and began an integration of peoples into the ceremonial center. The Inka allied with Pachacamac in an attempt to consolidate their power (Bruhns 1994:335). During this time, there is an abandonment of the ramp pyramids (Eeckhout 1999:116). Although there were palaces built by the Inka, including a Temple of the Sun, as well as an *Aqlla Wasi* for the Inka's "chosen women" (Figure 7.8), Pachacamac continued to be a functioning city until the arrival of the Spanish in 1533. Pachacamac remained a great religious center and pilgrimage destination throughout its long standing occupation, as well. Ethnohistories describe the city as having a large center with walls and ceremonial spaces in addition to living spaces for the permanent residents and the pilgrims. Those permanent residents are believed to have included both the local peoples who maintained and supported the site as well as smaller populations representing the areas where Pachacamac welded influence (Eeckhout 1999; Ravines 1997). Arriving in 1533, Pizzaro was the first to describe Pachacamac, and he expounded on the fear and reverence with which it was viewed (Ravines 1997:9).

Customarily the distinction for pilgrims throughout the Andes has been Pachacamac, and it has been considered to have been a primary pilgrimage center from its beginning. (Bauer and Stanish 2001:12). There have been numerous cemeteries excavated, both around and within the city, with a great many of these being centered around the main temples. It is believed that these cemeteries contain burials that include not just local elites and city residents, but also those who made pilgrimages and brought "rich offerings to the sanctuary". Hernando Pizarro discovered that during the 16th century, pilgrims were traveling as far as 1600 km to pay respects and make requests at the shrine of Pachacamac. (de Xerez 1985). Other chroniclers have noted that lodging was built for pilgrims at the site (Cobo 1990[1653]:85-90).

In 1896, Max Unhle's work for the University of Pennsylvania became one of the first major scientific excavations at Pachacamac (Uhle 1903, 1991). During the 1940's, another portion of the site was excavated by Julio C. Tello, one of the primer pioneers of Peruvian archaeology (Tello 1943). Strong and Corbett, contemporaries with Tello, also began excavations at the Temple of the Sun during this same time period (Strong et al. 1943). It was during the 1960s that excavation began on the Late Intermediate Period occupations. These excavations were carried out by several different archaeologists, including Jimenez Borja (Jimenez Borja 1985; Jimenez Borja and Bueno Mendoza 1970). Modern research at Pachacamac has been sponsored by the Peruvian government. Currently, there is a museum at the site which curates all of the finds. Despite the great importance of this site, very little work has been published since the early work done by Uhle, and of those publications, very little has been published regarding these analyses.

Sample History

Peruvian archaeological pioneer, Max Uhle, excavated at Pachacamac before the arrival of Hrdlička in 1910. In 1896, Uhle, undertook the largest mission of his career- the excavations and subsequent 1903 report from the University of Pennsylvania. This expedition had an "immediate and lasting effect on American Archaeology" (Rowe and Uhle 1954:6). After his expedition, Uhle continued working for the University of Pennsylvania on occasion.

In his 1910 expedition to South America Aleš Hrdlička was able to collect over 2,200 crania from Pachacamac. During his expedition, he was able to travel throughout South America, gathering collections for the Smithsonian. This museum now houses a majority of this collection. In 1915, a small portion of the collection was transferred to the San Diego Museum of Man for an exhibition at the Pan-Columbian Exposition, and then the collection remained as the foundation of the San Diego Museum of Man collections. Hrdlička seems to have taken the simple approach of collecting all the better preserved crania so that he might amass what he would later refer to as "the most valuable reliably pre-Columbian study series in existence" (Hrdlička, ms:626). A sample of 586 crania from this collection (235 females, 293 males, 30 undetermined and 28 subadults) were analyzed in this study. Due to the collecting methods (surface collecting from looted burials), the crania collected by Hrdlička precluded any detailed information regarding and temporal context.

Bioarchaeological Hypotheses

There are several alternative hypotheses that should also be explored. The first is it is entirely possible that the sample only represents one particular group, as was seen with the Maya at Blue Creek. Therefore, it would seem likely that with this scenario, modification practices would be more homogenous.

The crania from these cemeteries could be representative of large households that would include the local elite and those whom they employed. Though, it would seem highly unlikely that these crania simply represent one individual cemetery group or group of people. While it is important to remember there is probability that a large population of pilgrims traveled to Pachacamac, and similar to the expectations of foreign traders residing at Blue Creek, the amount of those who died and were buried there was probably low. Considering Pachacamac would have required a large local working staff component, it could be assumed the burial population would most reflect the local population.

Results

The sample reveals that a large percentage of the population which exhibited modified crania, and the type of modification is quite homogenous.

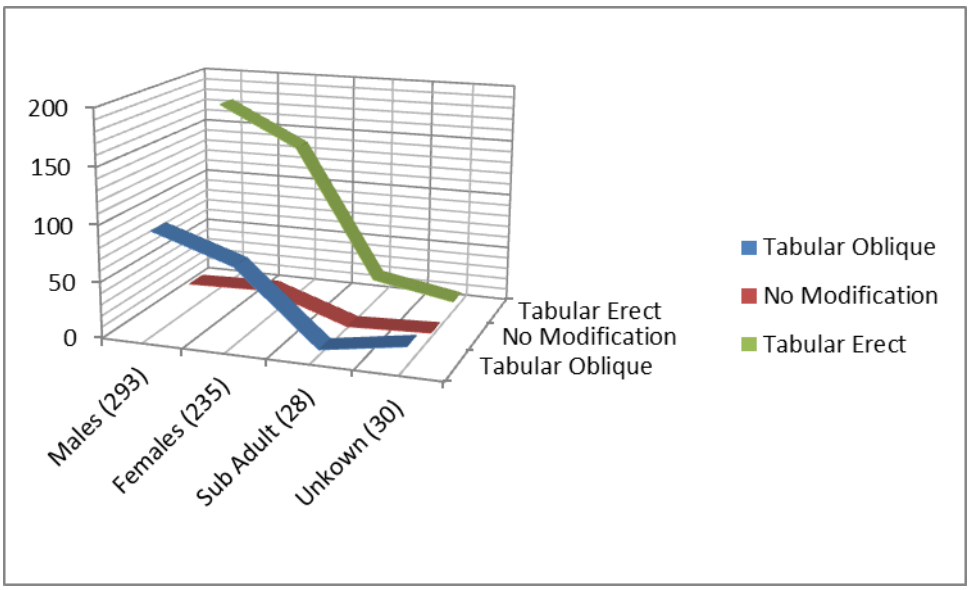


Chart 7.6 Pachacamac cranial modification distribution

A large percentage of the sample crania displayed evidence of unintentional modification, commensurate with cradleboarding practices (n=186 or 31.74%). The remaining crania which displayed intentional cranial modification (N=292 or 49.82%). This indicates that

while there were a significant number of individuals who did not display cranial modification, there was a large frequency which did. Among those who did display cranial modification, the majority were determined to be men (males 269/119; females 209/67). Another significant finding is the crania from Pachacamac all appear to represent the tabular form of modification (Figure 2.1). This is a startling homogeneity given the expectation that Pachacamac functioned as a pan-Andean center, and that at least the occasional highland pilgrim or resident originally from the altiplano would be reflected in a sample this size.

Due to the lack of annular forms of modification, the data suggests that the Pachacamac sample does not reflect a diverse, urban, interregional pilgrimage center. In his analysis of over 2,200, crania Aleš Hrdlička noted that he could find "no specimen…which would show the 'aymara' type deformation" (Hrdlička 1912:21). The expectation was that some individuals buried here would present this type of modification since pilgrims from the highlands were expected. So, this analysis is particularly interesting, as it would seem that the Pachacamac burial population does not support previous theories of great diversity.

Andean Sites: Pachacamac

Site	Modified(Asymmetry)	Unmodified	Total
	Male		
Pachacamac	269 (119)	24	293
	Female		
Pachacamac	209 (67)	26	235
Total	**478**	**50**	**528**

Table 7.6 *Source:* Data collected by J. Han Smithsonian Museum of Natural History Collections.

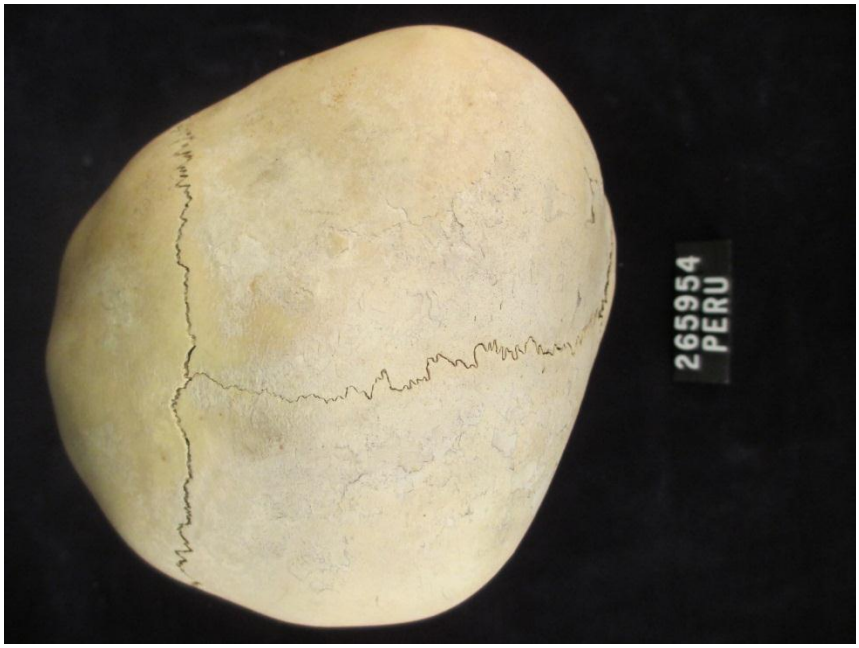


Figure 7.9 Crania from Pachacamac displaying asymmetry from possible use of cradleboard. *Source:Smithsonian Collections. Photo: J. Han*

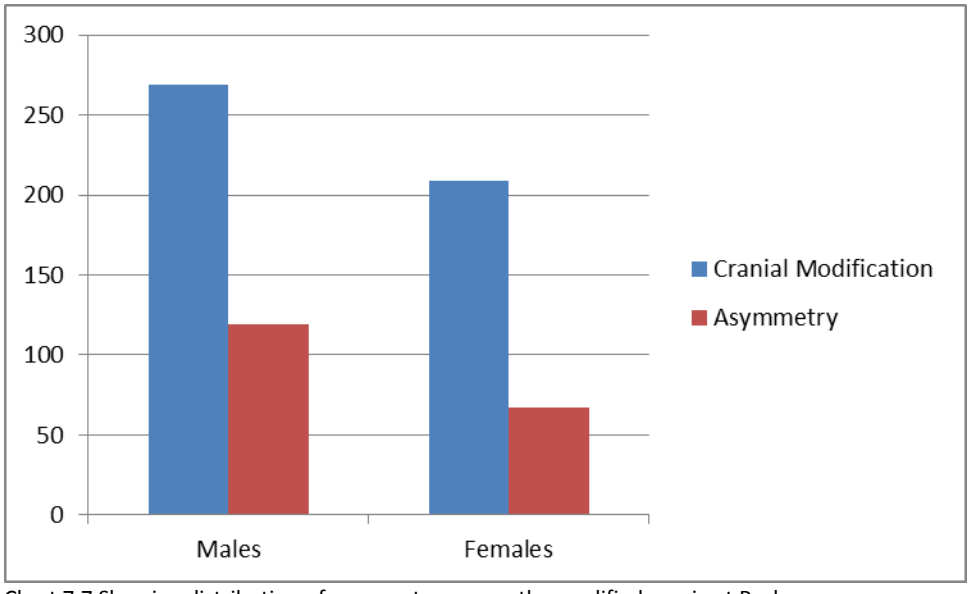


Chart 7.7 Showing distribution of asymmetry among the modified crania at Pachacamac.

There is great homogeneity in the sample, implying homogeneity in modification technique. Most of the crania show only a minor modification, with some expansion of the parietal area and concomitant flattening of the frontal bone. None of the modified crania sample (n = 478) was placed in the most pronounced category of modification (Group 4) with the bulk, 53.44% (n = 155, of the male crania falling in the more moderate group (3). The bulk of the female crania sample (40.94% or n = 95) falls into group 2, with some flattening of the frontal area, particularly, and distinct pressure at lambda.

Moreover, there is no consistency to the medio-lateral angle of pressure on the posterior of the crania. While a majority of the modified crania were symmetrical (n = 478 or 81.56%), 186 individuals had some asymmetry. There was only a slightly significant difference between males and females, with males exhibiting more asymmetry (n = 119 or 24% of modified crania) among the male crania this was distributed between those with more pressure on the left (n = 63) and those with more pressure on the right (n = 56). For the females, the distribution was similar to that of the males (left n = 38 and right n = 29). For the most part, these were slight irregularities that would not have been noticeable in life, with only a few minor exceptions. There are several explanations as to how these irregularities may have occurred. One explanation incorporates the use of cradleboards by the mothers. However, as previously thought, the asymmetry does not appear an indicator that intentional modification did not occur. Data supports, rather, that the modification was of a flexible construct rather than a static one as previously noted.

Discussion

In contrast to the expectations set forth, that Andean societies did not practice cranial modification in the same regard as Maya cultures, and, furthermore, for an urban inter-regional pilgrimage center, there is not a tremendous variety revealed in the cranial modification. There is no means to make other judgments of social status by burial types, locations, or evidence of grave goods since there was no ability for systematic excavation in the Pachacamac sample. There are some indicators of poor health. There is the possibility that, due to Pachacamac sites prestige as a religious center, there was a great deal of state support, allowing the populace to live a less disease and stressed existence (Bauer and Stanish 2001:7).

Although there are two different groups created in the sample between the modified and unmodified crania, the anticipated large difference is not present. Additionally, there are no apparent indicators of health difference between these groups, or the two different groups of varying cranial modification. This information lends to the idea that, as with Maya crania, there are no differences, as indicated by cranial modification, in social status.

Figure 7.10 Tabular Erect form of cranial modification as seen at Pachacamac. Source: Smithsonian Collections. *Photo: J. Han*

Figure 7.11 Pachacamac covers almost 600 hectares. *Source: P. Eeckhout*

Alternate Hypotheses

Since the data did not reveal the expected lack of modification or the great diversity as expected, the activities at Pachacamac come into question. Earlier, several alternate hypotheses were presented. First was the possibility the sample of representative of a single group, which either had resided at Pachacamac or had traveled there. The cranial modification seen by this data would support the expectation for this hypothesis. However, considering the means by and time period in which the crania for this sample were collected, the idea that a single group of people are represented becomes more difficult to perceive.

The second alternate hypothesis is that the sample represents a population of locals who were primarily staff for the priests and local elite. The data from this sample again meets the expectation that a general homogeneity would be seen under these circumstances. Additionally, it is unexpected that a large population of pilgrims died while at Pachacamac. It is conceivable that a large and complex pilgrimage center would require a large population of people to support the religious elite as well as a foreign population.

Finally, it is interesting that there have been no indications that Pachacamac attracted pilgrims from the highlands, or that it supported a resident highland population. Many researchers have argued repeatedly that Pachacamac was an attraction for foreign populations (i.e. Eeckhout 1999:84, Fleming et al. 1983:142, Uhle 1903). Fleming et al. (1983) argued that as early as the Middle Horizon, Pachacamac was already becoming the primary meeting point for the neighboring cultures along the coast of Peru. These included the more recently developed societies of the Chimu in the north, and the Nazca in the south. (Fleming et al. 1983:142). A longstanding feature of this site has been the varied iconographic motifs, the basis of Fleming et al.'s (1983) statement.

However, there have been recent developments in the study of Pachacamac, which indicate this site did not become a primary pilgrimage center until the Inka Empire took control of the urban center during the Late Horizon. This may explain why the crania from this site all appear to be of the local modification variety. Eeckhout (2013) identifies that recent excavations of the main cemetery suggested the burial population is that of local residents. To confirm what the material culture suggests, Eeckhout (2013) performed isotopic analysis on a reduced population of individuals from the main cemetery. Six of those individuals demonstrated local geographic homogeneity. One individual may have been the exception, with possible access to different production areas. In contrast to this finding, there were two other individuals dating to later time periods, which "suggested residential mobility, tentatively indicating a change in pilgrimage customs under Inca rule" (Eeckhout 2013:146).

Hrdlička had noted that none of the crania from Pachacamac presented the annular variety of modification, and went further to suggest that, based on his findings, he felt sure that there had been a lack of highland population at Pachacamac. Based on the collection method for his sample, Hrdlička's statement seems to be a large assumption. However, based on data, there is a level of doubt raised regarding the extent of the involvement of the highland populations. The type of modification present is that which is seen in those populations living on the coast. These populations are probably those which operated the site at Pachacamac. Ethnohistoric sources state that there was large festival -like situations that involved different populations from without the Andean region, and, during these gatherings, large temporary housing was constructed. It has been argued that similar gatherings in the sacred highlands took place, to which coastal peoples would attend (Rostworowski de Diez Canseco 1999:213).

The implication from this hypothesis lends to the belief that Pachacamac and other pilgrimage centers would only serve visitors from outside the region during the festival periods. Furthermore, this would suggest that Pachacamac did not support a standing population which practiced the annular variety of modification. Thus, the crania sample would likely reflect the social organization and local residents of Pachacamac. If we compare Pachacamac with other pilgrimage sites, we may reveal additional details.

Andean Pilgrimage Centers

Three major ceremonial centers in the Andean Region grew to prominence beyond their local areas. The most prestigious may have been Pachacamac, followed by Cahuachi and the Islands of the Sun and Moon. All three of these sites would have been considered the most sacred locations, and would have attracted very large numbers of pilgrims from throughout the Andean region (Bauer and Stanish 2001:1 and Cobo 1990 [1653]:94). These sites would have been state sponsored and would have received support in the forms of labor and construction. Although there were scores of local shrines which were receiving veneration and support from their local communities (Bauer and Stanish 2001:7), the power and respect that the three large sites commanded made them more unique in their ability to attract pilgrims from great distances. Despite changing allegiances, these three power sites had an importance that outlasted political entities; they were so important that they were often even used to legitimize state control over particular areas. Bauer and Stanish (2001) noted that "the mere fact that a pilgrimage center associated with the dominant state exists on or near and older sacred site sends a powerful message of cultural dominance or legitimate succession" (Bauer and Stanish 2001:18). At Pachacamac, these are seen through the various construction phases present.

Cahuachi

Farther south on the coast of Peru, is the site of Cahuachi. Throughout the Early Intermediate period, this site was used by the Nasca. Like Pachacamac, this site appears to have also been used for a millennium (Silvermen 1993:39). During the time of the conquest, this site had already fallen into a state of disuse, thus, only through archaeology has this site been identified as an interregional ceremonial center. Silverman notes that Cahuachi should be considered "a ceremonial center, by virtue of its sacredness, could also be expected to be an appropriate locus for burial" (Silverman 1993:305).The archaeological data includes ritual paraphernalia, a high concentration of burials, and the presence of temple mounds (Silverman 1993:300-309). This idea is reinforced when Silverman (1993) notes the high number of burials and offerings dating to periods after the use of this site. Although Cahuachi served the same purpose as Pachacamac, it never acquired the same size and stature of its counterpart. Unlike Pachacamac, Cahuachi's "population size, density, and composition changed in accordance with cyclical ritual and political calendars" (Silverman 1993:319). Thus, this site functioned solely as a ceremonial space, unlike Pachacamac, which had a large urban area surrounding it. There have been numerous enclosures discovered that are large enough to have supported populations of pilgrims during ceremonial activities (Bruhns 1994:199).

Although the burials from Cahuachi have received little analysis, there has been some work done. In her research, Silverman provides a short discussion on some of the burials -those from her own excavations as well as those form work earlier in the century. Possibly an indicator of Cahuchi's sacredness and prestige, Silverman notes that there is a trend in more elaborate burials after the site's peak. Thus far, the data has only indicated the presence of cranial modification on occasion. According to Silvermen (1993), only a handful of burials describe cranial modification, and those have been simply described as long and flat forms (Silverman

1993:195-217). Showing a lack of health or status indicators, a series of burials analyzed by Patrick Charmichael indicate that all categories of individuals are buried together. He notes "evidence for intrasite spatial patterning on the basis of status is therefore absent" (Charmichael 1995:171). There appeared to be no connections between status, health or mortuary practice in Charmichaels' (1995) examinations.

From the above, comparing pilgrimage sites information, it appears that the evidence from Pachacamac and Cahuachi are equitable. The fact that the cranial modification styles vary seems to indicate a consistency with modification practices in non-stratified societies, in that there is no single preferred form of modification. Cahuachi, it seems closely mirrors modification styles seen among the Nasca populations, just as how Pachacamac modification styles were much like those of the coastal populations.

Conclusion

The data analyzed and reviewed in this thesis does support the idea that Pachacamac functioned as interregional religious center that catered to scores of pilgrims from throughout the Andean region. It is likely, though, that the data is derived from burials of local populations only. It would be highly likely that these crania represent the burials of those responsible for maintain the site, populations most likely from the coastal areas. Arguments for homogeneity in complex societies imply there is the existence of unification among the group. It might be argued that what happened at this site is the religious fulfilling the role as the state. Possibly rather than associating oneself with a particular geographic location or ethnic group, this population aligned themselves with the belief system that controlled a very large geographic area. In that case, rather than having a state- sanctioned practice of cranial modification, there

was a religious- sanctioned practice of modification. This was identified in the theory of the Maya populations emulating the Maize God.

From the remains analyzed at these Andean pilgrimage centers, there is an indication that the burials consisted of local populations. From this information, it would seem there is no connection between cranial modification and the pilgrimage center. Rather, any cranial modification present is strictly reflective of the local population within which the ceremonial center is located. Based on the information, it is clear that these large important pilgrimage centers deserve much more research in order to fully answer the question as to whom is buried there. Closer examination of grave good and mortuary practices may provide the additional insight needed to help reveal these centers of importance.

CHAPTER 8: Conclusion

In this thesis, I have used a bioarchaeological approach to examine the remains of 586 individuals from pre-Columbian Andes; I have synthesized 63 from the Maya center at Blue Creek from the data provided by Dr. William Brown, bioarchaeologist with the Maya Research Center. Cranial modification has been analyzed in societies with varying degrees of socioeconomic complexity, allowing for the exploration of boundary between the body and society. Cranial modification in these archaeological populations has been instrumental in helping decipher group and individual identity. This research has also provided the opportunity to explore complex social processes through which human development was altered to serve a social end. As Meskell has noted, "the body is not passively mapped, but is interwoven with, and constitutive of, systems of meaning, signification, and representation. On the one hand it is a signifying and signified body; on the other it is an object of systems of social coercion, legal inscription, and sexual and economic exchange" (Meskell 1998:147). Other forms of modification, possibly not recognizable in the archaeological record, reflect individually the social world of the groups that create and display them. Cranial modification is only one form.

This chapter will summarize the results of my research into cranial modification among Maya and Andean societies. This data will be examined considering research in social complexity, ethnicity, geography, and sex. The findings and implications of this study will be discussed. The samples which provided case studies for exploring the primary hypothesis the potential for other signifiers of identity, in concert with analysis of body modification, will be explored to obtain new information about social life in the past.

Bioarchaeological Hypotheses

In this thesis, I have analyzed the practice of cranial modification in Maya and Andean populations. Sex seems to have only a minimal effect on the decision to shape the head among the Maya societies, and no effect on the Andean groups. Significant differences are only present at a few sites, and the only visible overarching pattern seems to be the lack of one style over a specific time period. This occasional relationship between cranial modification and a person's sex may be an indication of the role cranial modification serves in local marriage practices, wherein one may marry outside the family unit.

A group's geographic location does have significant impact on head shaping practices. The inhabitants of the Andean areas, for example, show a distinctive head shaping pattern. For Andean regions, there are selective patterns: tabular forms on the coast and annular forms in the highlands. The Maya regions tend to show only tabular forms. Although there are two distinct variations on these forms, there are no annular forms in the samples analyzed for this thesis.

Maya Societies

In the course of this thesis, the findings from the Maya regions indicate that there was generally a state-wide practice of cranial modification. Beginning in the late Preclassic periods and extending through to the Postclassic period, people all across the Maya regions practiced cranial modification of the tabular variety. There were some differences regarding sex when, during the Postclassic period, males discontinued the use of the tabular oblique variety. Geographically, the same forms of modification were practiced region wide sites from the Yucatan in Mexico, to Belize and El Salvador. All practiced the same forms of cranial modification with minimal variation.

The data presented in this research indicates that there is a high instance of cranial modification. Perhaps the greatest difference appears with the research that was done by Tiesler (1999) where her findings indicate the largest collection of crania with cranial modification. Another interesting note is the high incidence of the lack of cranial modification at the Blue Creek site. One hypothesis for this would be that these burials date from the terminal period of this site and that there are several non-Maya individuals present. In Maya society, research has indicated that the populations practiced cranial modification as a means of group identity. Therefore, such a high number of non-modified crania appear to indicate an outside influence. In Maya societies, cranial modification was not used to create groups within each population, but rather to convey a group identity to those outside the population, maintain solidarity within it, or achieve some state-decreed ideal.

Andean Societies

From the analysis of the crania from the Andean regions, it would appear that these populations practiced intentional cranial modification similar to that of the Maya cultures, although this type of modification was restricted to the coastal areas, as it is not seen in the highlands of the region. There were no differences regarding sex or temporal condition with the practice of cranial modification among the Andean populations.

Unlike the Maya population, which practiced a homogenous variation of cranial modification as an indication of Maya community membership, the Andean populations practiced variations of cranial modification to indicate a regional membership, in addition to state level membership. Although not analyzed as part of this paper, other research has been devoted to highland population, which practiced the annular form of modification. The coastal

regions investigated for this thesis practiced the tabular forms of modification, as was also seen in the Maya regions.

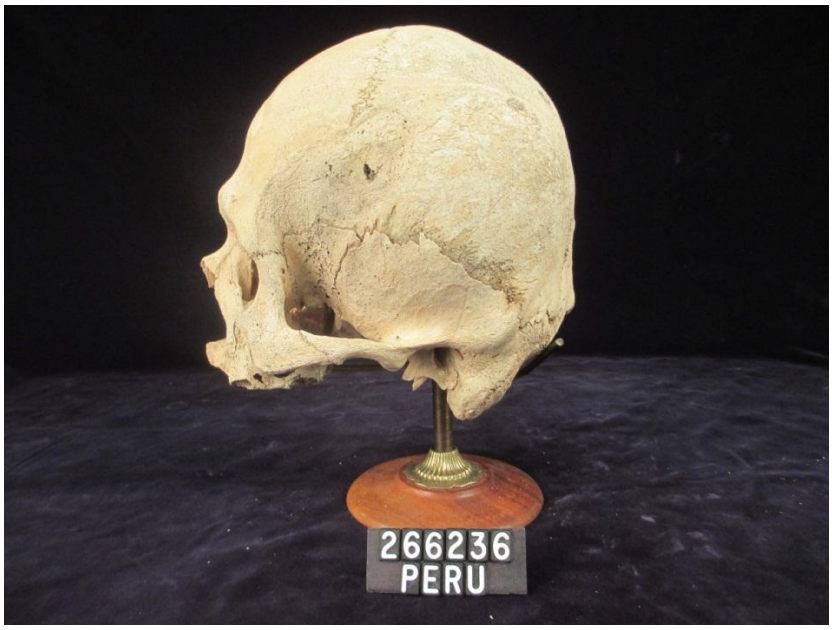


Figure 8.1 Tabular Erect form of modification as found in the Pachacamac site. *Source: Smithsonian Collections. Photo: J. Han*

Summary of Findings

Maya

The first case study in this thesis focused on the Maya urban center of Blue Creek. This site provided a sample that including detailed information regarding cranial modification, as well as other factors were considered, including dental modification, mortuary practice and grave goods. This sample also allowed for consideration of pathological conditions, which were useful in determining the social status of the burial population. It was argued that, for this population, there would be a level of homogeneity which is typically found in complex societies, and that it would be distributed throughout the site. However, the analyzed data disagreed with this hypothesis. Rather, there was a large population of unmodified crania at the site of Blue Creek. There had been an argument for the possibility of a foreign presence at Blue Creek, but careful

analysis of this site's location made this theory improbable due to the closeness of other Maya centers, including a primary capital site, Tikal.

Andean

The final case study in this paper focused on the paramount Andean ceremonial center, the site of Pachacamac. Despite the lack of context for this sample, the Pachacamac crania examined provided an exceptional opportunity to examine cranial modification in a complex group, as well as to investigate hypotheses concerning pilgrimage. It was argued that there should be diversity in both presence and variation of type of modification at Pachacamac due to the site being a large urban pilgrimage center, which served the entire Andean region. It was believed that burials at this site would contain the remains of pilgrims, locals, elites, priests, all those who traveled throughout the Andes, and those who lived here. However, analyzed data disagreed with this hypothesis. Rather, the crania from Pachacamac revealed a parallel between this site and other sites where complex social stratification is present.

There had been an argument for the presence of permanent foreign populations at Pachacamac, but data indicates differently. There is the possibility that the religious calendar was quite strict, and a trip for foreigners from the highlands was more infrequent, comparatively, than the coastal populations or neighboring regions. Additionally, the same pattern is seen with the crania analyzed from the ceremonial center at Cahuachi, where the burial population did not differ markedly from the regional groups. Thus, it would seem pilgrimage center burials reflect the local cranial modification practices rather than a burial population of foreigners with non-local cranial modification variation.

Implications and Future Research

The results do not indicate a direct relationship between cranial modification and political function. There also appears to be a relationship between modification practice and the local environment. Although research in the field of cranial modification has been carried out for over a century, there is much work that continues to be performed. The research in this thesis has generated new questions for future research in this field. Although the sample crania for this paper are substantial, it is skewed towards coastal areas. Thus, it could be augmented and balanced, if additional crania were added to this thesis, more detailed patterns may be revealed.

The examination of remains from Maya regions suggests that there was little variety with cranial modification, with the tabular oblique and tabular erect varieties appearing through all temporal periods. However, there were far more unmodified crania within the Maya region than the Andean site of Pachacamac. This was especially interesting in light of the proposed hypothesis for the Andean site.

Although the focus of this paper has been cranial modification in complex societies, head shape is just one example of how people use symbols to create and manipulate social boundaries. As noted by Richardson and Shaw (1998), the body is "a visible and effective means of expressing taste, identity and sexuality" (Richardson and Shaw 1998:1) While other body modification can be viewed in a similar way, it seems that the modification of the crania reflects a strong and less a malleable belief system. There are several body modifications that can be seen in the archaeological record, the alteration of the human body for cultural reasons is wide spread throughout humanity, both temporally and geographically. This area has, in the past, been the field of anthropologists, ethnographers, and others who study the living. However, this research has proven that these investigations need not be limited to modifications that affect

only the skin. The use of dental decoration is another example of archaeologically visible body modification.

Finally, cranial modification is only one trait used as a signifier of identity. There are numerous others that can also be analyzed and contribute to our work in understanding social identities, including mortuary ritual, iconography, and grave goods. The possible opportunities to examine and understand differences between the fluid and the fixed identity may stem from the additional research and analysis of those signifiers, better understanding of the individual and the group, and how they interact with each other. This analysis holds the key for the most potential for expanding our knowledge the interface between social and biological, but for also gaining insight into how societies construct their own identities.

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Appendix A

Time Period	Tabular Oblique	Tabular Erect	Total
Classic	11	12	23
Postclassic	3	4	7
Total	**14**	**16**	**30**

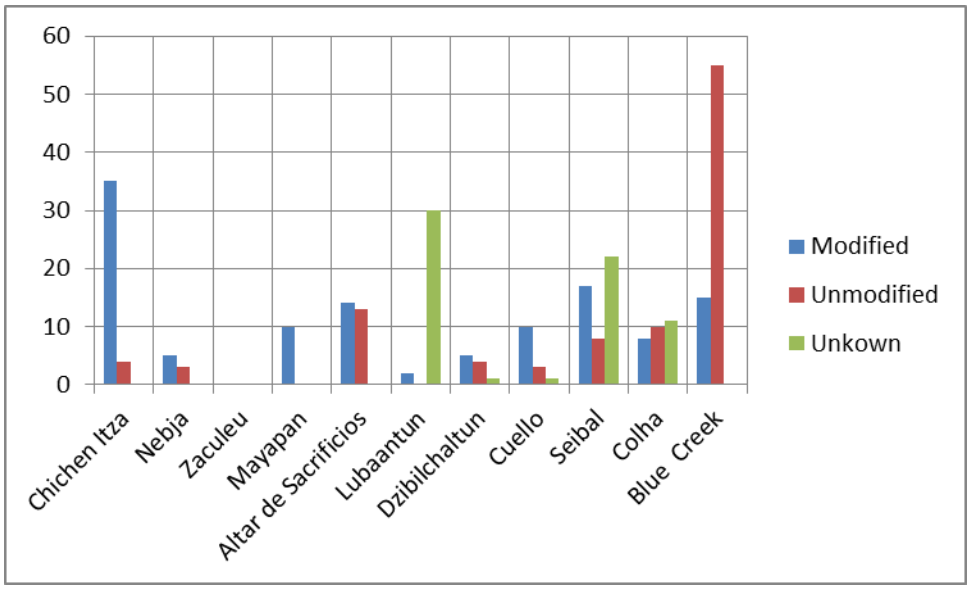
Temporal Differences in Cranial Modification in the Maya region

Appendix B

	Tabular Oblique	Tabular Erect	Total
	Classic Period		
Males	5	9	14
Females	6	3	10
	Postclassic Period		
Males	0	3	3
Females	3	1	4
Total	**14**	**16**	**31**

Comparison of cranial modification by Sex, Classic and Postclassic periods.

Appendix C



Demonstrating cranial variation distribution in Maya regions.

Appendix D

	Unmodified	Modified	Unknown
Chichen Itza	4	35	0
Nebaj	3	5	0
Zaculeu	0	0	0
Mayapan	0	10	0
Altar de Sacrificios	13	14	0
Lubaantun	0	2	30
Dzibilchaltun	4	5	1
Cuello	3	10	1
Seibal	8	17	22
Colha	10	8	11
Blue Creek	55	15	0
Total	100	121	65

Cranial Modification	Unmodified	Modified	Unknown
Tiesler's Study	83	594	63
Total	11%	80%	9%

Cranial Modification distribution in the Maya region.