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Dental Modification among the Classic Maya of Chac Balam and San Juan, Ambergris Caye, Belize

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DENTAL MODIFICATION AMONG THE CLASSIC MAYA OF CHAC BALAM AND SAN JUAN, AMBERGRIS CAYE, BELIZE

by
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A thesis submitted to the faculty of the University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College

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DEDICATION

To my family, whose unwavering support has been my anchor throughout this journey. To my advisors and professors, whose guidance and expertise have shaped my understanding. And to the countless individuals who inspired and contributed to this work, your invaluable contributions have made this thesis possible. This achievement is as much yours as it is mine

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ABSTRACT

Perceptions of beauty and health are embedded within everyday actions, even a simple smile. How do dental modification practices among the Classic Maya from Ambergris Caye, Belize relate to these perceptions and a person's identity and status? This thesis analyzes the practice of notching, filing, and placing inlays in maxillary incisors and canines through a qualitative analysis of Classic period AD 250-1000 Maya teeth from the sites of San Juan and Chac Balam. A lack of patterns related to sex, socioeconomic status, and the type of modification in the dentition of five individuals, including two males, two females and one person of unspecified sex, including one adolescent, suggest that the practice of dental modification may have related to a ritual marking a transformative stage in the Maya person's life, as suggested by research in other parts of Mesoamerica. We can relate past dental modifications to modern ones in US society, like braces and veneers, and our perceptions of the perfect smile.

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CHAPTER ONE:

Introduction

This thesis focuses on tooth modification of individuals from two Classic Maya sites on Ambergris Caye, Belize, which were excavated for three years beginning in 1986 (Figures 1, 2; Guderjan and Garber 1995b). I argue that dental modification from a sample of individuals from the sites Chac Balam and San Juan marked a stage in the person's life where a transformation occurred, and that dental modification practiced among the Maya in the past may inform us about the meaning of standards of therapeutic and beauty practices today. In modern US culture, we whiten and straighten our teeth, even changing the size and shape of our lips to frame our smiles. Some modern practices are gendered, and all shift with the invention of modern technologies and fashion trends across different generations. Modern practices are also regional, as well as affected by economic status. This study may also provide insight into perceptions of health and beauty among other past Maya and Mesoamerican burial populations.

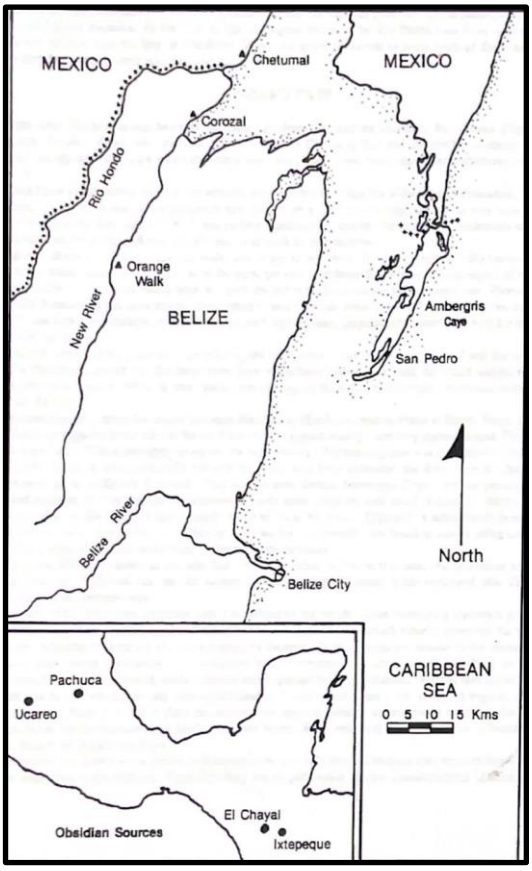

Figure 1 Location of Ambergris Caye, Belize (Guderjan 1995a: Figure 1).

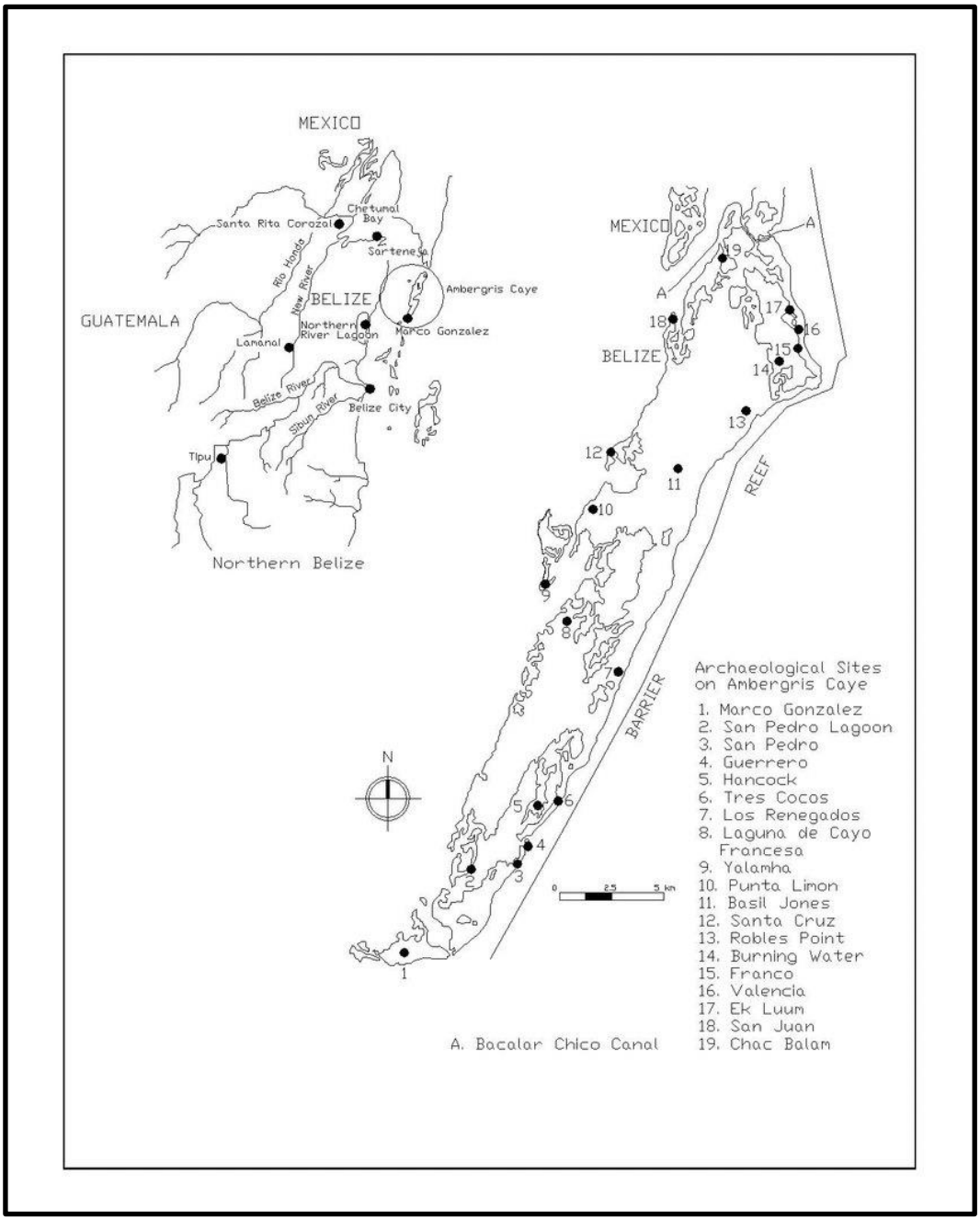

Figure 2 Map of Ambergris Caye archaeological sites (Simmons and Graham 2017:168, Figure 1).

Research on tooth modification among the ancient Maya connects the practice to specific cultural contexts that may relate to status, familial, and cultural practices such as coming of age rituals. It is important to note that only teeth that were permanent and visible were the ones that were modified, but that a wide variety of techniques were practiced, from notching, to filing and placing semi-precious stones as inlays into teeth. I analyze dental modifications present in individuals buried at Chac Balam and San Juan (Figures 1, 2) that are curated at the University of Mississippi and show how the modifications present in this burial sample may have related to the end of childhood. I also relate this to therapeutic and beauty practices that are utilized in past and present-day society in the United States. My analysis offers new insight into the cultural practices on Ambergris Caye, Belize, relates the findings to those from other Maya sites, and more broadly adds to research on cross cultural dental modification.

Methods and Sampling

I applied a mixed methods qualitative approach to analyze the data from Ambergris Caye and compare it with findings reported at other Maya sites. The Romero (1970) classification system based on Mesoamerican teeth organizes dental modification according to patterns in notching, inlay, and filing. I used this system as a reference for classifying the teeth from each site and created a spreadsheet to record the data found. For each site, I went through each individual burial curated at the University of Mississippi and recorded the 1) presence or absence of teeth, 2) teeth with dental modification, and then 3) classified the modified teeth using the Romero system in collaboration with thesis advisor Dr. Freiwald. I then analyzed the teeth I reviewed burial samples published for other Maya sites to compare modification patterns based

on sex, age, status, and Romero classifications, and used these data to interpret my findings for the individuals found at San Juan and Chac Balam.

Thesis Overview

This study is organized in five chapters. Chapter 1 aims to introduce my research question, present the methodology, and provide my contribution and hypothesis. Next, Chapter 2 reviews literature on the sites in my study and on research on dental modification among the ancient Maya from different viewpoints. Chapter 3 pays specific attention to dental development and its relation to tooth modification practices, followed by Chapter 4, which contains my results from the Ambergris Caye samples and compares them to results of other studies. Lastly, Chapter 5 concludes my thesis by restating my results and connecting my findings to present day therapeutic and beauty practices done on teeth today in North American society.

Conclusion

The analysis of tooth modification among the ancient Maya individuals from the sites of San Juan and Chac Balam on Ambergris Caye, Belize, reveals a compelling connection between dental practices, societal status, and a ritual marking a stage in the Maya person's life where a transformation may have occurred to mark the end of childhood. Through a mixed-methods approach, this research demonstrates that dental modification served as a symbol of status and signified the transition into adulthood within Maya culture. The utilization of the Romero classification system allows for comparison of the several types of dental modifications present in the sample to test hypotheses about the cultural significance of the practices.

Furthermore, this study contributes to the broader understanding of dental modification among the ancient Maya by providing a nuanced analysis of burial sites previously unexplored in relation to tooth modification and reasons the Maya may have practiced it. By correlating the presence of dental modifications with factors such as biological sex, age, and social status, this research adds depth to our comprehension of Maya societal structures and cultural practices.

In addition to shedding light on ancient Maya culture, this research will also prompt reflection on contemporary dental practices in North American society. The parallels drawn between ancient tooth modification rituals and modern-day cosmetic dentistry highlight the enduring significance of dental aesthetics and their connection to societal norms and perceptions of beauty.

In conclusion, this thesis provides valuable insights into the cultural significance of tooth modification among the ancient Maya and its implications for understanding broader societal structures. By bridging the gap between past and present dental practices, this research underscores the enduring relevance of archaeological inquiry in illuminating the complexities of human culture and behavior.

CHAPTER TWO:

Literature Review

Introduction

My research question explores tooth modification found in individuals buried at two sites on Ambergris Caye in Belize, specifically dental inlays and filing, as well as the history, societal influence, and broader significance of cosmetic dentistry past and present. My background research aims to establish the importance and purpose of dental inlay and filing modifications among the Classic Maya and connects tooth modification found at San Juan and Chac Balam to conceptualizations of modern modification practices such as braces and veneers. The notions of sociocultural hierarchy and origins of the perfect smile theory (Khalid and Quiñonez 2015; Wickstrom 2016) guide my understanding of Classic Maya tooth modification practices. My research is divided into four sections that include: history of settlement on the Ambergris Caye, classification of tooth modification types, linguistic anthropology and smiling among the ancient Maya, and present-day dental modifications.

In my first two sections I provide a brief overview of the history and settlement of the ancient Maya on Ambergris Caye and explain the cultural importance of body modification practices in this region. Analysis of the dental inlay and filing modification is most relevant to my research, and I explore how it relates to the cultural climate of the ancient Maya in the Ambergris Caye. In the second section, I examine the practice of classifying diverse types of modifications according to the Romero (1970) classification system.

In my third section, I explore theory on the purpose of tooth modification and the reasons dental inlay and filing practices occurred, who modified their teeth, and what it might have meant to them. In the concluding section, I examine the modern dental modifications such as braces and veneers to attempt a purposeful connection to practices in ancient Maya populations. The background provides a basis for my research into tooth modification patterns of the San Juan and Chac Balam sites to better understand its purpose for the ancient Maya culture and modern populations.

The People and Settlement of the Ambergris Caye

Guderjan and colleagues (1995b) conducted excavations on the Ambergris Caye as part of the Ambergris Caye Archaeological Project from 1986-1988 to explore maritime trade and political economy. Guderjan (1995b) stated that the early settlement of Ambergris Caye is evidenced from sites like Chac Balam, which show Early Classic period occupation after AD 300. Settlements on the island grew, and by the Late Classic period after AD 600, sites like San Juan and Laguna de Cayo Frances used access to the open Caribbean for access to trade wide running trade networks. These sites were situated on the calm leeward side of Ambergris Caye to participate in coastal trade as the windward side of the island made canoe travel dangerous beyond the reef (Guderjan 1995b). San Juan was used until sometime after AD 1000, when occupation on the island moved to other sites.

The project team members discovered burials of the inhabitants of these sites, including 9 burials at San Juan and 29 burials at Chac Balam. Guderjan (2004) suggests that small coastal sites like these are not as esteemed for their complexity as large inland operations were, but that they might be overlooked for the information they can provide. For example, Chac Balam Burial

14 contained a large number of exotic and special goods which suggest a high-status individual. Guderjan argues that mercantile success in small but impactful trade areas of the Ambergris Caye institutionalized high status use of expensive goods and cultural practices to display elite or even royal-like social identities on the island. This social stratification is thought by Guderjan to be connected to body modification practices in life as well as the extravagant burial practices found at Chac Balam, integrating island and inland cultures. Guderjan acknowledged that populations of Ambergris Caye had differential access to exotic goods, but argued that sites like Chac Balam, San Juan, and Laguna de Cayo Frances all had access to materials acquired over long distances.

Maya Bioarcheology and Body Modification

There are many distinct types of body modification found in Classic Maya culture, including dental modification. Tiesler et. al. (2017) report that body modification practices like piercing, tattooing, and bone or tooth modification in Maya culture reflect cultural identity and social status. Other researchers have explored connections to sex, family or region, age, health, and beauty.

Inlays and filing were common practices among the ancient Maya, and Tiesler et al. (2017) theorized the meaning of the modification by using scaled bioarcheological and odonatological approximations from their sample of 300 scored teeth from the 900 preserved in their sample. The teeth varied by age and biological sex, and the analysis considered drilling depth, associated decay, and filing. Tiesler and colleagues (2017) suggest a high success rate with drilling, and that drilled teeth had minimal decay. Filing was more prominent in younger age groups, while inlays were more common in older age groups. However, neither technique

was exclusive to a gender (biological sex) or age group. Tiesler et al. (2017) conclude that these tooth modifications were ideologically driven and that they were symbols of beauty and distinction that were likely followed by broad segments of society.

A study by Hernandez-Bolio et al. (2022) analyzed several types of modification, including dental inlays and tooth filing, possibly related therapeutic properties that helped strengthen and keep teeth clean. An experimental study evaluated eight Mesoamerican teeth with preserved sealants and tooth fillings. The components of these sealants aided in hygiene due to the internal dentinary reabsorptions and pulp perforations, which were additional benefits of tooth modification.

Verdugo et al. (2020) added to these findings by conducting a study of 102 modified incisors from individuals buried in a cave in Belize, the majority (60%) from females (2020:6). Close relationships among the females were found through matrilineal DNA analysis, suggesting that the tooth modifications related to kinship. The authors also noted connections to status and prestige, as well as religious constructs.

Tiesler (1999) investigated dental decoration of around fifteen hundred pre-Hispanic burials from ninety-four sites found in Mexico, Guatemala, and Honduras. She defined the basic unit of her biocultural analysis as the phenomena of an "individual" who is constituted by the system he or she participates in. This definition is important in understanding why dental decoration was performed, as Tiesler reports that dental decoration lost most of its connotation of a social indicator, at least in this sample, and became more of a familial ritual signifying a stage in the Maya person's life where a transformation was occurring.

For example, dental inlays were found in individuals around 13-14 years of age, while filing occurred all throughout life. Tiesler theorized that these types of decoration may have occurred in a familial connotation as the distribution of types of decoration differed between housing complexes in Copan, Honduras, and outlying settlements. Tiesler concluded that this type of information is not only important to biological and demographic research but is also important to social research.

Similarly, Scherer (2018) investigated body modification through a lens of religious and cultural identity in the Maya culture. Scherer saw the head of the body among the Maya as the most important body part because it was the main hub for engaging the world and society through many types of sensory endeavors. From this realization, Scherer relayed that while Maya beliefs evolved over time, they generally believed that the human body was crafted more than created. This interpretation is important to understanding tooth modification because the types of modifications reflected how the Maya portrayed themselves by crafting their own bodies. Scherer wrote that the Classic Maya often referred to the head as the metonym to one's whole self, and that what is thought or felt by someone is known only to the beholder, so modification was often a way that the Maya were able to express their thoughts, beliefs, and current state of life.

Scherer (2018) reported on sixty-four Maya individuals found in the Usumacinta River kingdom of southeastern Mexico and northwestern Guatemala that consisted of thirty-seven individuals with evidence of tooth modification. In this sample, deciduous teeth were rarely ever modified, and modification occurred usually after the development of the anterior teeth (12-13 years of age) and around the time that young, not fully developed, male and females exited the

state of *ch'ok* and entered into *k'atun* (~20 years of age), although this is not found in all cases of tooth modification. When addressing the purpose of these modifications, Scherer revealed that present day notions of identity can be hard to apply to the ancient Maya, as our definitions may not correlate with their beliefs. Scherer relayed that many body modifications, tooth modifications included, are not necessarily projections of a group identity, but rather are evidence of shared belief systems and practices among the Classic period Maya in the Usumacinta River kingdoms.

Overall, body modification occurred throughout the Maya region, and may have related to familial and individual identity. Specifically with tooth modification, Tiesler et. al. (2017) and Scherer (2018) found that tooth modification in the ancient Maya related to spiritual beliefs and represented transitions from adolescence into adulthood. In some places, younger individuals had tooth modification, and in others, it may have been linked to status. These findings show how the practice of tooth modification related to practices of maturing as an individual, but with site and regional variability that suggest a variety of cultural factors were important.

Romero Classification System

Tooth modification is found all throughout Mesoamerica, and the first step to understanding it is to identify the types of modification. Romero (1970) created a system of classifying modifications according to tooth and modification type and position in Mesoamerican individuals. Romero assembled his data for the tooth modification chart (Figure 3) based on the altered contour of the dental crown, altered labial surface of the crown, and both the altered contour and labial surface of the crown.

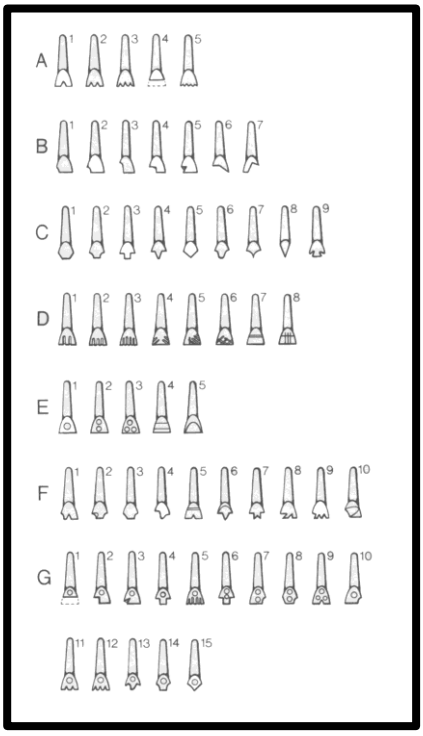

Figure 3 Romero (1970: 51, 1) classification of modified dentition

Romero (1970) found dentition patterns are important in establishing where certain groups might have originated. He wrote that filing and incrustations found in filling modifications originated during the early Preclassic period of the ancient Maya (about 1400 B.C.) and incrustation during the middle Preclassic. Concerning incrustation, some of the popular stones used include pyrite, jadeite, and turquoise. Romero states that the practice of incrustations was similar to jewelry making, and that people might have experienced sensitive teeth due to the drilling. Romero also believed that things like powdered pyrite may have been used to fill cavities and keep teeth healthy.

This idea is important to my analysis because it helps bridge the gap into how modern and ancient dental practices may relate. How do modern practices differ from those of the ancient Maya, other than varied materials and techniques? My analysis will use Romero's chart to identify the type of modification, age range, and burial structure to theorize why tooth modifications occurred at certain ages and to explain the type of which modification used.

Art, Iconography, and Language

Iconographic and linguistic analyses offer another way to interpret the meaning of dental modification among ancient Maya peoples. The contexts in which smiling, where dental decoration would have been visible to others, is recorded infrequently in art. Everyday images of Maya people rarely depict visible teeth, even as most art focuses on elite activities or is found on elite objects like polychrome ceramics. Some examples of this can be seen in ancient Maya figurines that provide insight into the culture and daily life of the Maya people. These images provide a glimpse into the meaning behind dental modification as part of a person's appearance.

Cowen and Keltner (2020) aimed to investigate the expression of emotion in the art of Mesoamerican figurines, sculptures, and reliefs to explore the universality of emotion. They compiled sixty-three artworks and isolated facial depictions to gather judgements from Western test subjects regarding the various emotions and features found in their compiled depictions. Their research uncovered distinct dimensions of facial expressions in ancient Mesoamerican artwork and how the Western participants were able to relate to them in different contexts, which sheds light on the emotional expressions depicted in the artifacts. They were able to demonstrate insights into how psychological behavior can be taken from expressions and depictions seen in ancient art, which shows the behavior of ancient peoples independent of contemporary Western

culture. Cowen and Keltner (2020) acknowledged that there are certain issues of authenticity in ancient Mesoamerican sculptures and that potential bias is present in the evaluation of the contexts portrayed in the sculptures, but they empathize the need for future studies with a broader sample of sculptures and other contexts of analyzing expression of emotion in ancient societies.

Examples of smiling represented through figurines include the "*Sonrientes*," or *Smiling Figurines* (Figure 4) of the Remojadas art. These figurines have very close kinship to Maya figurines, as seen in *Head of a Rain God* (Figure 5), due to their appearances that are depicted with attributes that relate to different deities (Sarro, 2018). Sarro (2018) said that the *sonrientes* lack a clear purpose and there is debate on whether they served a function in rituals or were discarded due to damage. The *sonrientes* are often considered male, and they challenge gender norms with their ambiguous features, which suggests that they represent spiritual entities. Sarro (2018) writes that within this context, the *sonrientes* may represent spiritual beings that guard human remains, which are similar to paintings that are depicted at the site in which they were found.

Figure 4 "*Sonrientes*" or smiling (Sarro, 2018)

Figure 5 the head of a rain god Maya sculpture presenting a deity with a smile (Doyle, n.d.).

In a similar fashion, the field of linguistic anthropology offers some insight into understanding how smiling was depicted among the ancient Maya. Linguistic anthropologists aim to study language within its cultural context, which allows us to understand societal norms, values, and behaviors. An example of this can be found in the context of the translation of the Spanish word for smile, using the translation dictionary by Patricia (2008), "*sonrisa*," into the Ch'olan (Colonial Yucatec) language of the ancient Maya. Specifically, "K'as che' ej," provides us some insight, and can be broken down as follows: "k" might be related to laughter, "as" could denote an action, "che'" might refer to us or others, and "ej" may imply a visual element that is observed. The translation to "laughing at us" in English suggests a nuanced cultural perspective on smiling and/or laughter. This may imply a communal aspect, where the act of smiling is not only an individual expression but involves a social dimension—laughter directed at someone or shared with others.

This linguistic analysis underlines the intricacy of language and culture. The Yucatec Maya translation provides a glimpse into the cultural significance of smiling, that may suggest a communal aspect, possibly tied to shared experiences or interactions. Linguistic nuances, especially regarding expressions related to emotions like smiling, can offer valuable insights that complement the archaeological study of ancient societies. This in turn has implications for understanding why the ancient Maya may have practiced dental modification and decoration in order to share it with one another in a social context.

Present Conceptualizations of Identity and the "Perfect Smile"

Studies by Wickstrom (2016) and Khalid and Quiñonez (2015) both suggest that modern dental esthetics are influenced by social constructs of beauty, specifically in the norm of straight

white teeth within some modern societies. Khalid and Quiñonez (2015) conducted a literature review and found that the extent to which tooth whitening in North American society has become prevalent relates to beauty constructs and socio-cultural factors that link white teeth to cleanliness and hygiene for status purposes. Their study highlights a fixation on bodily practices for self-improvement in North American society, particularly focusing on the idealization of straight, white teeth. Through their interdisciplinary exploration drawing from anthropology, biology, dentistry, sociology, and social psychology, their research addresses key questions regarding the origins, basis, and propagation of this beauty ideal. Khalid and Quiñonez include theory by Pierre Bourdieu and Michel Foucault to elucidate how straight, white teeth reinforce class distinctions and contribute to the exercise of societal disciplinary power play. Ultimately, their findings underline how dental aesthetics are intertwined with self-identity and social structure, serving as tangible symbols of social advantage or disadvantage (Khalid and Quiñonez 2015).

Wickstrom (2016) added to these findings by conducting an observational ethnographic study of 83 randomly selected consultations and 8 randomly selected patients at two state-run orthodontic clinics in Sweden, stating that straight-looking teeth have become a norm in orthodontic work due to constructs of "… ideal occlusion or psychosocial benefit." Wickstrom suggests that the emphasis on achieving a "normal bite" and aesthetically pleasing teeth reflects broader constructs of ideal occlusion and benefits of status within society. This reinforces the cultural pressure for individuals to conform to certain dental standards, which may influence attitudes towards achieving the desire for straight-looking teeth to align with contemporary trends in cosmetic dentistry. Wickstrom highlights this phenomenon by discussing the pervasive

influence of societal beauty standards on health care practices not only to achieve a hygienic purpose in orthodontic work, but a beauty standard.

Overall, these sources indicate that the look of one’s teeth are important in today's social constructs of society that concern beauty and socio-cultural status. People transform their teeth to fit into today's standards of beauty, while also showing prestige and good hygiene practices from a socio-cultural perspective. We might theorize how the way teeth looked to the Classic Maya also related to beauty and health standards, first by establishing what dental standards were and then comparing patterns found in the Maya region to those in the Ambergris Caye burial populations that are the subject of this study.

CHAPTER THREE:

Dentition Development and Implications for Maya Modification

Introduction

Dentition development is used today as a way of detecting deviations from the normal in order to create diagnosis and treatment plans for patients, but the ancient Maya also may have considered dental eruption in how they altered their teeth to conform to societal practices and norms. The study of teeth is crucial to anthropologists due to the dense and hard enamel that resists decay in the ground and oftentimes outlasts bone (Bass, 2005). At the San Juan and Chac Balam archaeological sites on the Ambergris Caye, it is interesting to note that no modification was found any earlier than the estimated age of 13-16 in the San Juan Burial 8 individual. Figure 6 shows the dental eruption of this individual at the approximate age at death. These findings correlate with the notion of an age-related ritual marking a stage in the Maya person's life that may relate to modification of teeth and dental development.

Human Dentition

There are four main types of teeth found within the human dental arcade, including incisors, canines, premolars, and molars (Bass, 2005). The diverse types of teeth serve various functions from cutting to tearing and grinding food, aiding in the process of digestion as seen defined in Table 1 and Figure 6. Each tooth has three areas (crown, neck, and the root) and consists of enamel, cementum, and dentin. Each of these teeth contains five surfaces that include the labial or buccal, lingual, occlusal, mesial, and distal surface.

Table 1 Types of teeth in the human dental arcade, adapted from Bass (2005).

Tooth Type:	**Name:**	**Purpose:**
I	Incisor	a tooth designed for cutting
C	Canine	teeth with pointed cusps for tearing and incising
P	Premolars	teeth with broad occlusal surfaces with multiple cusps for grinding and reducing food material as an aid to digestion
M	Molars	same as premolars but with broader surface

Modification is often not found on those individuals before the age of full dentition eruption, likely because modified deciduous teeth would be lost. At approximately six months of age, the first deciduous teeth begin to be visible, but dental eruption cannot be used to accurately determine age until age 12 where dental calcification and eruption occur (AlQahtani, 2010; Bass, 2005). Notably, from the sample on the Ambergris Caye of thirty-eight burials, the timing of modification of four of the individuals is unknown, but the youngest died at approximately 13-16 years, close to the time that human dentition for commonly modified teeth, like the incisors and canines, are fully erupted.

Variability in dental formation also may have impacted when teeth were considered 'ready' to be modified. AlQahtani et al. (2010) states that during infancy, tooth formation is least variable, whereas at ages 16 and variability increases, especially with the third molar. Bass (2005) reports that in cases of the congenital absence of teeth, the third molars are the most common to be missing. The increase in variability from the age of 16 can be attributed to many

factors including genetics, environmental factors, and diet. In a twin-study done by Trakinienė et al. (2021), they found that a large proportion of their sample with third molar impaction could be attributed to genetic effects and a common environment.

Conclusion

By understanding the development of the human dental arch, we can explore tooth modification practices among the ancient Maya in several ways. Understanding that tooth formation is least variable during infancy and becomes most variable after the age of sixteen can provide insights into when tooth modification practices may have been most effective and/or feasible among the ancient Maya. Next, understanding the influence of genetics and the environment on dental development may have influenced ancient Maya modification as these certain conditions could have affected the success or outcome of tooth modification procedures. Lastly, dietary factors are important in development variability, as the diet of the ancient Maya included the consumption of foods such as maize, which could have encouraged the presence of caries and may have influenced the need or desire for tooth modification to address dental issues caused by diet. Overall, these factors and understanding of dentition development help broaden our understanding of ancient dental practices and cultural beliefs surrounding dental aesthetics and function of modification.

CHAPTER FOUR:

Ambergris Caye Sites and Results

Introduction

A small sample of five males and females, 13% of the overall sample, exhibited five forms of dental modifications characterized by the Romero classification system as A1, A4, B4, C7, and E1. Differences in sex, age, and status underline the widespread nature of dental alterations among different demographic groups and highlight the importance of contextualizing such practices within broader anthropological frameworks. Comparisons to studies by Tiesler et al. (2017), Tiesler (1999), Scherer (2018), Hernandez-Bolio et al. (2022), Verdugo et al. (2020), Williams & White (2006), and Geller (2006) all provide valuable insights into the broader cultural and symbolic meanings behind dental modification practices at these two Ambergris Caye sites, and more broadly contributes to a deeper understanding of ancient Maya beliefs, social structures, and cultural practices, ultimately shedding light on the complexities of Mesoamerican societies.

Ambergris Caye Site Results

The tooth modification practices at the Ambergris Caye included five individuals out of thirty-eight subjects at San Juan and Chac Balam, from a total of twenty-one subjects in the sample that contained teeth (Table 2). These five individuals in the Ambergris Caye sample had thirty-six percent of their teeth modified, including twenty-three teeth with maxillary modification and four with mandibular modification.

Table 2: Dental modification according to the Romero system from San Juan (SJ) and Chac Balam (CB), Ambergris Caye, Belize (NS = no stone inlay present). Adapted from Guderjan (1995a).

Burial and Individual:	Biological Sex:	Age:	Status:	Tooth:	Romero:
SJ 5	Male	20-35	middle/high	maxillary left central incisor	B4
SJ 8	Female	13-16	low	maxillary left lateral incisor	A4
				maxillary right lateral incisor	A4
				maxillary left central incisor	B4
				maxillary right central incisor	B4
				maxillary left canine	C7
				maxillary right canine	C7
CB 15	Female	20-35	low	maxillary left central incisor	B4
				maxillary right central incisor	B4
				mandibular left lateral incisor	A1
CB 18	N/A	adult	middle	maxillary central incisor	E1 (NS)
CB 23	Male	25-45	high	maxillary central incisor	E1 (NS)

The Romero B4 modification, consisting of a notched, was found in three individuals who died at different ages and were buried in contexts that suggest diverse socioeconomic statuses (Guderjan and Garber 1995b). San Juan Burial 5, a middle-to-high status male who died at age 20-35 years had a maxillary left central incisor that exhibited a B4 modification. San Juan Burial 8, a low-status female aged 13-16, had multiple teeth that displayed modifications: maxillary left and right lateral incisors (Romero A4), maxillary right and left central incisors (Romero B4), and both maxillary canines (Romero C7). At Chac Balam, Burial 15 was that of a low-status female aged 20-35 who had the maxillary left and right central incisors that exhibited a Romero classification of B4, along with the left lateral incisor that displayed a Romero A1 modification.

The Romero E1 modification was found in two individuals, suggesting a distinct cultural, religious, and or individual variation. Chac Balam Burial 18, a middle status adult of indeterminate age and sex had a central incisor that displayed a Romero classification of E1, although no stone was present. Lastly, Chac Balam Burial 23, a high-status male aged 24-45, had a maxillary central incisor that exhibited a Romero classification of E1 with no stone present.

The closest sites with published dental modification that can be used as comparisons for age, sex, and other patterns are in northern Belize, including Lamanai, Belize (Williams & White, 2006), Programme for Belize (PfB) in the Rio Bravo Conservation and Management Area (PfBAP) (Geller, 2006), along with one in central Belize called Midnight Terror Cave (MTC) (Verdugo et al., 2020), as well as large datasets that include 1500 individuals from ninety-four sites from Mexico, Guatemala, Belize, and Honduras (Tiesler et al., 2017; Tiesler 1999), a

sample from the Usumacinta River region of Guatemala and Mexico (Scherer, 2018), and Copan in Honduras, Holmul in Guatemala, and Baking Pot in Belize (Hernandez-Bolio et. al., 2022).

Sex-based dental modification in the Ambergris Caye sample included forty-percent male, forty-percent female, and twenty-percent individuals of unspecified sex. In comparison, Geller (2006) reported more modification in males than females in northern Belize in a sample size of 132, with twenty-six individuals who had modification present. Of this subsample, twenty-two individuals could be sexed, including five females and fourteen males. Next, Williams & White (2006) had a sample of sixty-one individuals at Lamanai in northern Belize, 36% of whom had dental modification. Of these individuals, 17 were female and 25 were male; modification was found most in females at 58%, but this was not statistically significant ($Z = -0.321$; $p = .911$).

In central Belize, Verdugo et al. (2020) reported on a large sample of 1,182 teeth from an unknown number of individuals recovered from the MTC cave. Just 8.6% or 102 teeth had modification, 60% of which were from females identified using mtDNA. However, both male and female teeth presented modifications, so Verdugo and colleagues were reluctant to state that modification was sex-linked. Similarly, Tiesler et al. (2017) reported 239 of 300 individuals with modified teeth with no significant difference between sexes in the frequency of dental modification. Moreover, no pattern or technique was exclusive to either sex.

In another study by Tiesler (1999), she presented a sample of 1,515, 80% of which had modification. Dental decoration was more common prominent in females (65.81%) than males (58.02%), with no exclusivity of technique or pattern according to sex. Scherer's (2018) Usumacinta sample also revealed no patterning in modification styles by sex albeit in a small

sample. Of 122 individuals with 64 teeth present, 57.8% were modified but sex was estimated for only 9 females and 8 males. Lastly, Hernandez-Bolio et al. (2022) reported on a sample of eight teeth, with two males and one female, all of whom had inlays/drilling. In sum, tooth modification does not relate to sex in populations on Ambergris Caye or elsewhere in the Maya region.

Furthermore, the type of modification according to the Romero classification system is an important indicator of whether certain types of modification were more common than others or related to status in ancient Maya society. In the Ambergris Caye sample, the B4 modification was most common and found in men and women. In contrast, the E1 modification was present in one male and one individual of unknown sex, and the A4, C7, and A1 modifications were present in the female samples. In comparison, Geller (2006), Williams & White (2006), Tiesler et al. (2017), Tiesler (1999), and Scherer (2018) all reported the B4 modification style as one of the most prominent in their samples for both males and females in the Maya region.

Patterns differed in the MTC cave sample analyzed by Verdugo et. al. (2020), who reported B5 and C3 as the most prominent modification styles. Burial context may partially explain this as these individuals were interred in one of the many cave burial sites in central Belize. However, comparison with surface sites is needed to further explore this difference. Overall, we can infer that B4 was a common modification style across many Maya cities, which Scherer (2018) related to paired upper incisors modified to form a T-shape, denoting wind or breath as related to the body's vital essence. Multi-tooth 'Ik' patterns include B4 and E or B4 and A pairings, which accentuated the T-shape of the upper dentition.

Age also was an important factor in whether modification was present. The Ambergris Caye sample consisted of adults with modification teeth, along with one adolescent who died

between 13 and 16 years of age. The biological age estimate, however, may misrepresent the individual's cultural age if dental modification was part of a ritual marking a stage in the Maya person's life where a transformation is occurring practice. In comparison, Geller (2006), Williams & White (2006), Tiesler et al. (2017), Tiesler (1999), Scherer (2018), and Hernandez-Bolio et al. (2022) all reported modifications only in adults, with 26.1% in the 10-20-year-old category in the Tiesler et al. (2017) sample. Scherer (2018) states that modification was clearly associated with age, and that modification seems to mark an important milestone and/or the completion of "crafting" a Maya person.

Lastly, status is also a factor in the presence of modification. At the Ambergris Caye sites, three individuals were of middle, middle/high, and high status, with the high-status individual having dental inlays. Status was classified in this sample based on the quantity and variety of grave goods that were present at the burial, as well as the burial's location (Guderjan 1995b). The two other individuals were both low status with no inlays present. Geller (2006) reported that modification occurred among all individuals of elevated status who could be assessed and among commoners (three elite, twenty-three central in the community or commoner non-tomb burials). Williams & White (2006) reported a high frequency in similar Romero styles, and discussed the relationship between status and kinship, including the roles of matri- and patrilineal descent. Verdugo et al. (2020) also related the high frequency of A2, B5, C3, & C9 in the MTC cave to marking membership in a kin group, potentially of higher status.

Tiesler's (2017) research also supports a link between dental modification and status, in that social ascription or gender roles were not directly linked to modification, but tooth inlays were most prominent and exclusive among Maya lowland elites. She interpreted the purpose of

the inlays as elite symbols of beauty and distinction among the broader sectors of society (Tiesler, 2017). In addition, Tiesler (2017) reported that more elite modifications were found in central areas, and that the presence or absence of modification was not a significant indicator of social differentiation and that its incidence neither increased or decreased with privilege.

Similarly, Scherer (2018) said that modification was not limited to elites, and that everyone had rights to modification once adulthood was achieved. Modification such as inlays may have been more common in elites due to the talent required to drill and affix the stone to the tooth, including jade stones that were used in distinctive shapes to possibly convey notions of power and legitimacy. Lastly, Hernandez-Bolton et. al. (2022) also concurred that modification was present in individuals of modest social standing and showed no evidence of royal or elite exclusivity.

Overall, the examination of modification within the Ambergris Caye burial site reveals both conformity and divergence from previously documented patterns of dental modification. Sex estimations are lacking for many Maya burials, and assignment of status differs among researchers, so broad comparisons are problematic. There is a need for further interdisciplinary research to expand the Maya sample and better elucidate the socio-cultural significance and variability of dental modifications within Mesoamerican contexts.

Conclusions

The analysis of the Ambergris Caye sites presents an opportunity to explore the practice of dental modification within the context of Mesoamerican cultures and expand on studies at other Classic Maya sites. These modifications offer valuable insight into sociocultural dynamics, beliefs, and practices that were prevalent among the ancient Maya populations inhabiting this

region. From my results, further research should investigate ritual practices marking life transformations that may relate to dental modification, as the present data concurs that it was the best indicator of why these different types of decorations were practiced among individuals aside from the other factors of sex, status, and type of modification.

CHAPTER FIVE:

Conclusion

In this thesis, I conducted an analysis of tooth modification practices among the ancient Maya, focusing on two archaeological sites on Ambergris Caye, Belize containing five individuals with tooth modification. I argue that dental modification at San Juan and Chac Balam served as a symbol of status and a ritual marking a stage in the Maya person's life where a transformation occurred from one life stage to the next. By utilizing the Romero classification system, I identified various types of dental modifications, including notching, inlay, and filing, and analyzed the relationship with biological sex, age, and status.

My results considered the relationship between dental modifications and several factors including age, sex, and status. Considering the results with those of other archaeological studies suggests that age is a more likely explanation than sex or status, although cultural and symbolic meanings may have been associated with dental modifications among Maya populations. If dental modification is related to coming-of-age transformations, additional research may contribute to a deeper understanding of Maya beliefs, social structures, and cultural practices.

Moving forward, further interdisciplinary research is needed to expand our sample size and elucidate the anthropological significance and variability of dental modifications within Mesoamerican contexts. This could involve examining additional archaeological sites, integrated archaeological, anthropological, and biological approaches, and considering the broader cultural and historical context of Maya civilization.

By continuing to investigate tooth modification practices among the ancient Maya, we gain a richer understanding of their beliefs, rituals, and social dynamics, while also drawing connections to contemporary practices of dental modification and aesthetics in modern society.

This begs the discussion of modern aesthetics and how they can be related to the purposes of tooth modification in ancient Maya culture. Today, we utilize braces, veneers, crowns, and various other dental procedures for cosmetic and hygienic purposes. From my 200+ hours in shadowing several types of dentists, these procedures often follow similar rituals in procuring things like braces and crowns. According to Naidu and Suresh (2019), children often start treatment planning around 7-12 years of age with their orthodontist and receive a fixed orthodontic appliance around age 12 and older after the eruption of all the permanent teeth. This type of connection can be drawn to when the ancient Maya began decorating their teeth at a similar age, to attain a long-term dental aesthetic ideal, as only anterior teeth that were permanent and visible were modified. In drawing parallels between modern dental aesthetics and ancient Maya tooth modification practices, we uncover intriguing similarities in the timing, rituals, and long-term aesthetic goals, underlining the enduring significance of dental aesthetics across diverse cultures and time periods.

Overall, this sample provides valuable information, but is too small to fully explain the practice of tooth modification as a transformation ritual during overall development to show where the Maya individual was at in their current state of life. From the studied information, we can rule out differences in sex and status as full explanations for modification, but it is important to note that further samples can be added to elucidate this information and add regional and familial affiliation to further study the occurrence of dental modification in Maya culture.

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