A look at Mayan artificial cranial deformation practices: morphological and cultural aspects

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Induced deformation of the cranial vault is one form of permanent alteration of the body that has been performed by human beings from the beginning of history as a way of differentiating from others. These procedures have been observed in different cultures, but were particularly widespread in Mesoamerica. The authors examined and reviewed the historical and anthropological literature of intentional deformation practices in Mayan culture. The Mayans performed different types of cranial deformations and used different techniques and instruments to deform children’s heads. The most remarkable morphological alteration is seen in the flattening of the frontal bone. Some archeological investigations link deformation types with specific periods. This article provides a glance at the cultural environment of the Mayans and demonstrates the heterogeneity of this interesting cultural phenomenon, which has changed over time. (DOI: 10.3171/2010.9.FOCUS10200)

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Permanent alterations of the body (such as dental modifications, scarification, mutilation, tattooing, body piercing, and other types of body art and ornaments) have been part of human culture from the beginning of history and have served as a way of differentiating oneself and one’s tribe or clan from others. Lip piercing was practiced among African and American tribes and was a sign of social status. Vikings employed dental modification in order to look fearless and for aesthetic purposes. Induced deformation of the neonatal cranial vault is another example of these types of practices.

Artificial (also known as intentional) cranial deformation results from manual manipulation of the skull and/or from the application of a deforming apparatus. It is manifested in morphological changes to the cranial vault. Artificial deformation can take many forms; Gerszten and Gerszten¹ discuss as many as 14 unique cranial shapes resulting from different methods of deformation. The practice of artificial cranial deformation has been documented on nearly every continent and may have begun as many as 30,000 years ago.¹⁸ The practice of deforming newborn heads was present in the whole of the American continent⁴ from North America to Patagonia, but cranial molding in neonates was most widely practiced in Mesoamerica. The Maya was the main Mesoamerican civilization, noted for its development of written language, architecture, and mathematical systems.²

The Mayans are among the most studied ethnic groups in the world. In many collections of Mayan skulls recovered by archaeologists, artificial cranial deformation is a common feature, and some collections show a diversity of deformation styles.³ When Columbus saw some of the natives in the New World, he wrote that they had “foreheads and heads much broader than any people.”⁶

In this paper, we analyze the historical precedents, mechanisms, different types, and role of cranial vault modification among the Mayans.

Methods

To gain perspective on this issue, we examined the historical and anthropological literature on intentional deformation practices in Mayan culture in the collections of the National Institute of Anthropology and History.
in México and the National Autonomous University of México. Evidence of different types of artificially deformed skulls was sought from archaeological collections and previous anthropological investigations.

In the 16th century, Spanish chroniclers provided numerous detailed descriptions of cranial deformation, methods, and materials popular among the Mayan people. Some fascinating fragments of these records are translated and shared with the neurosurgical community in this article.

For purposes of illustration, we also provide images of ancient Mayan art and figurines that represent cranial deformation.

**Results**

The Mayans lived in what is now the southeastern part of Mexico and northern parts of Central America. Pre-Hispanic Mayan culture is divided into 4 main periods: the Early Preclassic, Late Preclassic, Classic, and Postclassic. The Early Preclassic Maya is considered to date from 1400 to 1000 BC, the Late Preclassic period from 500 to 300 BC, the Classic period from AD 300 to 900 (when the Mayan cities reached their highest development), and the Postclassic period from AD 900 to 1540. We do not know at present precisely how the Mayan civilization originated. It almost appears as if it suddenly sprang into being, flourished, and then decayed just as suddenly. The practice of skull deformation seems to have been known from the earliest times. Among Mayans, the meaning of deformation was not only aesthetic but also religious and social.

Gonzalo Fernández de Oviedo, a Spanish chronicler, reports an interesting conversation about deformation between one Mayan and an early Spanish missionary, who questioned the Mayan about the meaning of the custom. The native was asked why the heads of his countrymen were not like those of the Christians. He replied that when the children were born, their skulls were plastic and so they could easily be molded into shape, thus producing a boss on each side and a great depression in the middle of the head extending from one side to the other. “This is done because our ancestors were told by the gods that if our heads were thus formed we should appear noble and handsome and better able to bear burdens.” According to Dembo and Imbelloni, the Mayans used hard implements in their deformation techniques. Several techniques existed, but the shaping of the head in neonates was carried out mainly in 2 ways: by compression of the head with pads and adjusted bindings and by restraining the child on specially designed cradles.

The Spanish Franciscan Diego de Landa described how the Mayans deformed the heads of their children in 1572. He describes the women as bringing up their children with the greatest roughness and says that as a rule the children went naked. Scarcely 4 or 5 days after birth the child was stretched out upon a sort of little bed made of reeds or strips of other material, and then the head was placed between two boards, one at the back and one at the front. These were then pressed together and fastened. For days at a time the child was thus left in suffering; Landa adds that sometimes so much pain was caused that the children died, and that he himself saw one who had open-nings behind the ears, a condition that, it was reported, was not uncommon (Fig. 1).

According to experts, 2 main head shapes existed: erect deformation and oblique deformation. Erect deformation (Fig. 2) is associated with cradle-boards, a deforming device that affected corporal mobility. The child was placed in a decubitus position, which is associated with lambdoidal flattening. The lambdoidal flattening was associated with erect deformation as a secondary, unintentional effect because of the position of the child in the cradle-board. The occipital flattening was often asymmetrical and was not limited to a single side but was noted on both the left and right sides.

Oblique deformation (Fig. 3) was attained without affecting the mobility of the child. Instead, paddles were applied directly to the head. This type of deformation had several variants. The pseudoanular, bilobulated, and trilobulated variants were all obtained when a frontal board was employed together with a system of bandaging.

Some archaeological investigations link deformation types with specific periods. Oblique deformation began during the Preclassic period (500–300 BC). During the Classic period, both the oblique form (with its pseudoanular variant) and the erect form are present. In the Postclassic period, the erect form was dominant, and it seems that the technique was widespread within the Mayan territory and had few variants.

**Fig. 1.** Photograph of Mayan figurine representing a woman with a child. The child is wearing a board on the forehead, which is part of a deforming device. (Figurine from Museo del Popol Vuh, ciudad de Guatemala. Catalog number 0379.) Photograph courtesy of V. Tiesler Blos.
Mayan cranial deformation practices

During the Classic period, evidence shows that skull deformation was characterized by a distinct social pattern (Fig. 4). The general population could only perform erect deformations. However, if children were destined to become governors, priests, or warriors or attain another high-status position, they were given oblique deformations. High-ranking Mayan families of the Classic period differentiated themselves from the lower classes with their head shape. This social hierarchy can be seen in pottery, figurines, drawings, monuments, and architecture, where characters with oblique deformation are dominant. After the Classic period, this pattern was less pronounced, probably because of the influence of neighboring cultures. According to some authors and based on the analysis of artistic representations, oblique deformation was meant to shape a child’s head to resemble the head of a jaguar, a sacred animal and symbol of power for the Mayans. Another hypothesis, based on analysis of paintings, is that the Mayans were trying to shape heads to resemble the head of the maize god, who was the symbol of fertility. Vera Tiesler performed one of the largest studies of Mayan skulls. She examined 175 deformed pre-Columbian Mayan skulls and was able to determine gender in 140 (69 female and 71 male). She found that 127 of these had the erect deformation and confirmed that the oblique shape was linked to elevated social standing. The obliquely deformed skulls were frequently accompanied by a postcoronal sulcus caused by bandages used to constrict the paddle against the forehead. The most remarkable morphological alteration is seen in the flattening of the frontal bone. The Mayas were naturally a brachycephalic people, and the custom of anteroposterior compression would promote this racial characteristic, causing the skull deformation to be displayed throughout life. The flattened skull is higher than nondeformed skulls of comparable age at death. Based on the figurines, paintings, and skulls that have been discovered, it seems that the greatest pressure seems to have been exerted upon the forehead. In many cases, the fron-
tal bone sloped backward to an amazing extent, causing the nose to be in line with the retracting forehead, modifying the appearance of the entire face.

In the more isolated modern Mayan settlements, this custom is still practiced, though not to the same extent.

**Discussion**

Cranial deformation practices are common in many areas of the world and are practiced for many reasons. The practice has mainly been documented in Egypt, Japan, South America, Mesoamerica, and some places in Europe.1

Anthropologists and other scientists have extensive knowledge of cranial deformation practices among ancient cultures. Some of the available information has been known for centuries. Although it is impossible to know the precise cultural environment, social organization, and religious conceptions that have led to this practice, it is clear that the practice is culturally influenced.1

Because of the plastic characteristic of the skull in newborns, skull modification was initiated during the first days of life and lasted for 2 or 3 years. This is done around the world to achieve specific adult head shapes.3

The first descriptions of cranial deformation among the Mayans were made by Spanish chroniclers in the 16th century. These descriptions (some of which are translated above) are historically invaluable,5,11 but most are superficial, highlighting the “primitive” parts of the custom, and are indeed interpretations. There is a lack of primary information directly from the Mayan culture.6

The cranial deformation practice was forgotten in the literature from the 16th century to 1843, when John L. Stephens published *Incidents of Travel in Yucatan*.14 Stephens describes an artificially deformed skull that he found during an excavation. Based on skull collections and writings about the Mayan practice of cranial deformation, it is clear that the custom was at one time widespread.

The deformations were not uniform, probably because of the physiological responses of the children, the duration of the compression, and the particular characteristics of the deforming device. Despite the variety of forms found in the osteological evidence, Romano12 says that only the oblique deformation is represented in the paintings of the classical Mayan period. This confirms that the cranial deformations were a permanently visible symbol of social affiliation.

Neurosurgeons have recently focused on the neurological effects of the deformations, but there is no scientific evidence of their having caused any neurological disability.9

From the point of view of the present, cranial deformation could seem to be a primitive practice. It may not be easy to understand why this custom was performed, but its practitioners found it socially and religiously appropriate. Doubtless, to the Mayans, the skull was a fundamental part of an individual’s identity, and cranial deformation was elevated to the level of art.

**Conclusions**

With this paper, we are only providing a glance at the Mayan culture and are trying to present this valuable information to the neurosurgical community. Artificial cranial deformation constitutes a biocultural process. Our investigation describes the main deforming techniques and the resulting morphological expressions. This article demonstrates the heterogeneity of this interesting cultural phenomenon, which has changed through time. In the past century, interest in this ancient custom has surged, and neurosurgeons should not be excluded from this fascinating discussion.

**Disclosure**

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.


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