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Unveiling Japan's ancient practice of cranial modification: The case of the Hirota people in Tanegashima

An international team of researchers report that the Hirota people, who lived on the southern Japanese island of Tanegashima between the late Yayoi period to the Kofun period (3rd to 7th century CE), practiced cranial modification.

Fukuoka, Japan—A team of biological anthropologists and archaeologists from Kyushu University and the University of Montana have broken new ground in our understanding on the practice of intentional cranial modification, a practice found in numerous ancient civilizations around the world.

Publishing in *PLOS ONE*, the team reports that the Hirota people, who lived on the southern Japanese island of Tanegashima around the 3rd century to 7th century CE, also partook in the practice. Moreover, the study found no significant differences in cranial modification between sexes, indicating that both males and females practiced intentional cranial modification.

Cranial modification is a form of body alteration where the head of a person is pressed or bound, usually at an early age, to permanently deform the skull. The practice predates written history, and researchers theorize that it was performed to signify group affiliation or demonstrate social status.

"One location in Japan that has long been associated with cranial deformation is the Hirota site on the Japanese island of Tanegashima, in Kagoshima Prefecture. This is a large-scale burial site of the Hirota people who lived there during the end of the Yayoi Period, around the 3rd century CE, to the Kofun Period, between the 5th and 7th century CE." explains Noriko Seguchi of Kyushu University's Faculty of Social and Cultural Studies who led the study. "This site was excavated from 1957 to 1959 and again from 2005 to 2006. From the initial excavation, we found remains with cranial deformations characterized by a short head and a flattened back of the skull, specifically the occipital bone and posterior parts of the parietal bones."

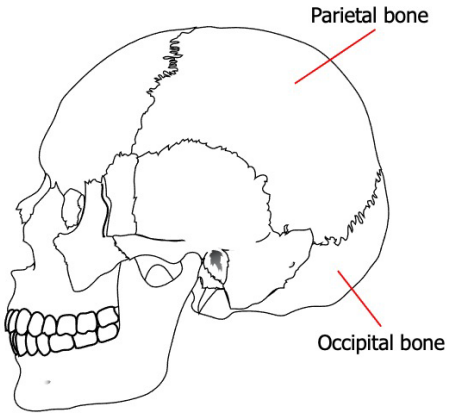

Fig. 4. Simplified diagram of a human skull with added labels indicating the location of the Parietal bone and Occipital bone. (commons.wikimedia.org) (CC BY-SA 4.0)

However, while the site provided an ideal opportunity to study the phenomenon, it had remained unclear whether these cranial modifications had been intentional, or were simply the unintended result of other habits.

To conduct the study, the research group employed a hybrid approach, utilizing 2D images to analyze the shape of the skulls' outline, as well as 3D scans of their surface. The group also compared crania data from other archeological sites in Japan, such as the Doigahama Yayoi people in Western Yamaguchi, and the Kyushu Island Jomon people, who were the hunter-gatherer predecessors to the Yayoi people. Along with visually assessing skull morphology, the team gathered all this data and statically analyzed the contours and shapes between the skulls.

"Our results revealed distinct cranial morphology and significant statistical variability between the Hirota individuals with the Kyushu Island Jomon and Doigahama Yayoi samples," continues Seguchi. "The presence of a flattened back of the skull characterized by changes in the occipital bone, along with depressions in parts of the skull that connects the bones together, specifically the sagittal and lambdoidal sutures, strongly suggested intentional cranial modification."

The motivations behind this practice remain unclear, but the researchers hypothesize that the Hirota people deformed their crania to preserve group identity and potentially facilitate long-distance trade of shellfish, as supported by archaeological evidence found at the site.

"Our findings significantly contribute to our understanding of the practice of intentional cranial modification in ancient societies," concludes Seguchi. "We hope that further investigations in the region will offer additional insights into the social and cultural significance of this practice in East Asia and the world."

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For more information about this research, see "Investigating intentional cranial modification:

A hybridized two-dimensional/three-dimensional study of the Hirota site, Tanegashima, Japan" Noriko Seguchi, James Frances Loftus III, Shiori Yonemoto, Mary-Margaret Murphy *PLOS ONE*, https://doi.org/10.1371/journal.pone.0289219

About Kyushu University

Kyushu University is one of Japan's leading research-oriented institutes of higher education since its founding in 1911. Home to around 19,000 students and 8,000 faculty and staff, Kyushu U's world-class research centers cover a wide range of study areas and research fields, from the humanities and arts to engineering and medical sciences. Its multiple campuses—including one of the largest in Japan—are located around Fukuoka City, a coastal metropolis on the southwestern Japanese island of Kyushu that is frequently ranked among the world's most livable cities and historically known as Japan's gateway to Asia. Through its Vision 2030, Kyushu U will 'Drive Social Change with Integrative Knowledge.' Its synergistic application of knowledge will encompass all of academia and solve issues in society while innovating new systems for a better future.

Fig. 1. Skeletal remains from the Hirota ruins. A photograph of the ancient human remains found at the Hirota ruins. A notable characteristic of the remains is the wearing of many shell accessories, indicative of the culture and trade of the region at the time. (The Kyushu University Museum)

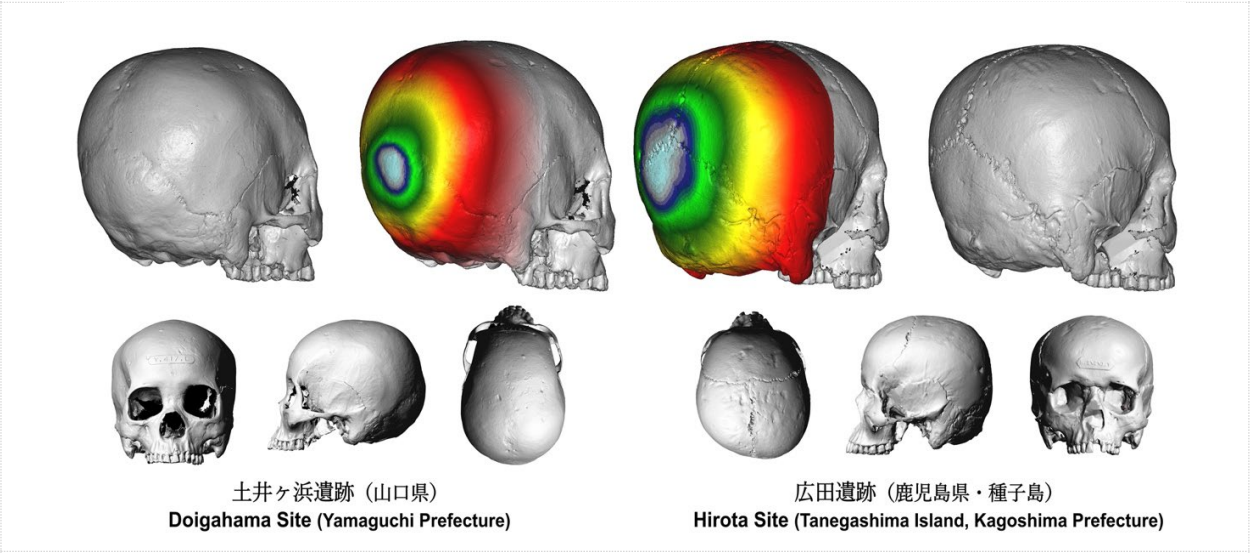

Fig. 2. 3D images of the skulls excavated from the Doigahama site (left) and the Hirota site (right). 3D images of skulls excavated from the Hirota site and the Doigahama site that the researchers used to compare skull morphology between the two groups. Notice that the skull from the Hirota site (right) has a more flattened back of the head compared to the skulls from the Doigahama site (left) indicating intentional cranial modification. (Seguchi Lab/Kyushu University)

Fig. 3. The Hirota ruins at Tanegashima in Kagoshima Prefecture, Japan. Photograph of the Hirota site today in Tanegashima, Japan. Each marker indicates where burials were found along with the notes on their sex and approximate age group. (The Kyushu University Museum)

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