Construction Design of the Keyhole-shaped Burial Mounds and the Process of Increase in their Size

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The use of new technologies such as laser metrology has enabled us to reconstruct the detailed three-dimensional shape of keyhole-shaped burial mounds. Drawing on the data, this article elucidates the standard designs of huge keyhole tombs and classifies them by lineage.

The analysis of standard designs of tombs and their mutual relationships mainly focuses on the following four tumuli that were recently laser-scanned: Nakatsuyama Tumulus (Tomb of Empress Nakatsuhiime) in Fujiidera City, Osaka Prefecture; Kamiishizu Misanzai Tumulus (Tomb of Emperor Richu) in Sakai City, Osaka Prefecture; Tsukuriyama Tumulus in Okayama City; and Kondagobyouyama Tumulus (Tomb of Emperor Ojin) in Habikino City, Osaka Prefecture. Their standard designs are examined in detail, mainly by comparing computer-modeled images and survey maps.

In order to determine which unit of measurement was used for standard designs, we measure the length between the center of the round rear portion and the point P where the vertical axis of the tomb is intersected by the ridge lines connecting the corners of the steps in the quadrangular front portion. This is the most reliable method because the locations of these points can be determined with a minimum discrepancy. Moreover, when the edge of the burial mound is ambiguous, the radius of the round rear portion can be easily estimated from the length between the two points, which is often 1.5 times longer than the radius of the round portion.

Using the above-mentioned method, this study reveals the following five facts: (1) the unit of measurement for length is *bu*, and the angle was determined by the ratio of the base to the height of a right-angled triangle; (2) the widths of the stepped terraces were determined in multiples of 0.5 *bu*, which were the basic unit of measurement, although it usually varied between the quadrangular front and round rear portions; (3) because standard designs hardly met the requirements of those who placed the order, modifications were added in the actual designing process (e.g. extending the length of the burial mound); (4) each tumulus was built based on a new standard design, rather than existing ones; and (5) standard designs were passed down within the same lineage though they grew in complexity.

Key words: Keyhole-shaped burial mound, standard design, laser metrology, linear measure