THE CONSERVATION AND PRESERVATION OF PERAK MAN FROM GUA GUNUNG RUNTUH SITE IN LENGGONG, PERAK , MALAYSIA

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Introduction

In 1990-91, archaeological excavations were conducted at Gua Gunung Runtuh in Lenggong, Perak by Professor Zuraina Majid and her team from the Centre For Archaeological Research Malaysia, Universiti Sains Malaysia, Penang. The excavations uncovered a primary burial of a 10,000-11,000 year old human skeleton (Zuraina Majid 1994). This skeleton was named "Perak Man" as it was found in the state of Perak in Malaysia. The Perak Man skeleton was an exceptional find as it was the most complete Paleolithic human skeleton so far discovered in Southeast Asia. The discovery also provided rare insights into Paleolithic burial practice and a deformity in the skeleton indicated that he was also the only prehistoric skeleton with a congenital deformity known as *Brachymesophalangia* Type 2A. The almost complete skeleton was found in a very fragile condition and required the skills of conservators and forensic scientists to remove and to conserve it (Chia and Sam 1994). Given the importance of the Perak Man and its significant contribution to knowledge, special attention and care were given to preserve and to conserve it for posterity. This paper presents the various steps taken so far to preserve and to conserve the Perak Man skeleton for long-term studies, storage and display.

The Cave and Its Environment

Gua Gunung Runtuh is a cave in the Bukit Kepala Gajah limestone complex. It is located about 150 metres above sea level and approximately 3 kilometres north of Lenggong town (Map 1). There are three entrances to the cave, situated about 75 metres above the lowlands. The cave, with an uneven cave floor enclosed an area of about 96 square metres, comprising large boulders of fallen stalactites. The floor in the heart of the cave was disturbed by guano diggers or treasure hunters. The cave was relatively dry, except for some damp patches at its southern entrance due to water dripping from the ceiling of the cave.

The immediate environment around Gua Gunung Runtuh comprised a dense tropical forest. The climate is generally hot and humid throughout the year, with temperatures of about 30° to 33° C and high relative humidity of between 80% and 90%. Gua Gunung Runtuh is located in the Lenggong Valley that is home to many archaeological sites. The Lenggong Valley thus far holds the longest culture sequence for Malaysian prehistory, from the Palaeolithic to the Neolithic and the Metal ages. The earliest sites in the Lenggong Valley include several open sites such as Bukit Jawa, about 300,000 years old as well as Kota Tampan, about 74,000 years old. Other prehistoric sites in the Lenggong valley comprised mostly caves and rockshelters in several limestone hill complexes.

The Perak Man

The Perak Man was found *in-situ*, about 80 cm below the surface of the cave floor. The soil was dry (2% moisture) and slightly alkaline at pH 8.15. The climate inside the cave was relatively stable, with the ambience relative humidity averaging at 89% over one week and temperatures varying from 23.5°C to 24.5°C . Such a stable condition must have contributed to the preservation of the Perak Man skeleton for more than 10,000 years.

The excavation revealed that a a man with a congenital deformity died at a very ripe old age of 40 – 45 and he was given a ceremonial burial. He was buried in a flexed position, with both legs folded up to the chest while the left hand was placed on the abdomen and the right hand at his right shoulder, both hands holding some meat. There were at least five types of animal meat - pig, deer, monitor lizard, tortoise, and monkey. The body was placed in an east-west orientation, with the head facing the east. The mortuary objects - 2,878 riverine foodshells and 10 stone tools were placed around the Perak Man. The riverine foodshells, *Brotia costula* and *Brotia spinosa*, were found scattered all over the

burial floor and probably over the body as well. Large shells were selected and placed closest to the body.

A multidisciplinary and scientific approach was used to study the Perak Man skeletal remains (Zuraina 1994). The results revealed interesting information about the Perak Man. The Perak Man was a 40 to 45 years old male, about 154 cm tall. He was born with a very rare genetic deformity known as *Brachymesophalangia*, the first of its kind reported in prehistoric remains (Jacob & Soepriyo 1994:58). The Perak Man had cranial metrics that showed Australo-melanesoid characteristics (Jacob & Soepriyo 1994:57) while the dental and limb metrics suggested affinities to an Australoid ancestry (Matsumura & Zuraina 1995).

On-site Conservation

The Perak Man skeleton was carefully exposed and cleaned using bamboo skewers or sticks to minimise scratching and scarring of the bones. The *in-situ* position of the skeleton as well as each of the bones were recorded and documented by standard established methods before removal. The very fragile condition of the Perak Man skeleton required each bone to be removed individually. Consolidation was needed for weak bones in particular, the rib bones, the pelvic bones, the spinal column, and some parts of the limb bones. Bones that do not need consolidation were carefully removed first. The fragmentary scapula had to be removed with the support and aid of a shaped block of plasticine. Brittle or weak bones were consolidated before removal using a solution of 3% to 5 % polyvinyl acetate in acetone, which was brushed on layer by layer with a 2.0 cm brush to ensure that it was absorbed into the bones. The fragile vertebral column was found in 3 parts and was removed by wrapping each of the columns separately with several layers of bandages coated with plaster

of Paris. All the bones that had been removed were carefully wrapped in bubble paper, labeled, and placed in paper boxes packed with newspaper for added protection during transportation to the site laboratory in Lenggong, Perak.

The skeletal remains were carefully unpacked at the site laboratory. Additional mechanical cleaning was needed to remove dirt and encrustations adhering to the bones with wooden skewers and steel needles. Soluble salts were removed from the bones by washing with water and by gentle brushing using a soft toothbrush. Insoluble salts such as stubborn adhering incrustations of calcium carbonate had to be removed by dissolving and cleaning the bones with a weak 10% to 15% acetic acid solution. The bones were thoroughly rinsed with water after cleaning to remove excess acids and then air-dried. After all the bones were cleaned and dried, broken pieces of bones were rejoined whenever possible using polyvinyl acetate adhesive.

The Perak Man skeleton was then reassembled and placed into a wooden box lined with styroform sheets and packed with styroform beads and newspapers for transportation back to Universiti Sains Malaysia in Penang for further conservation and analyses.

Post Excavation Conservation

The Perak Man skeleton was initially kept in a wooden box lined with styroform sheets in a room with intermittent air-conditioning. Some loosening of joints, peeling, and powdering was observed on the skeleton. Loosening of joints could have been caused by the wide fluctuation and variations in relative humidity and temperature. Powdering and peeling of the bones were likely caused by the hydration of salts to acid forms at high relative humidity and the crystallization of salts at low relative humidity.

The Perak Man skeleton had remained almost intact for more than 10,000 years in Gua Gunung Runtuh. The Perak Man survived for such a long time mainly because it was buried in a naturally controlled cave environment, with a relatively cool and constant temperature of 24° C and a relatively dry and slightly alkaline soil conditions that were suited for bone preservation. By excacating and removing him from the cave, we had disturbed his environmental equilibrium.

The obvious solution was to create another similar stable environment that could further conserve the skeleton. This was done by designing and constructing a special air-tight glass cabinet, with temperature and humidity control to store and conserve the Perak Man skeleton. The glass cabinet is kept in a room maintained at a constant temperature of 20° C day and night, through 24 hr. air-conditioning. The relative humidity inside the glass cabinet is placed between 45% and 50% using a humidity controller fixed inside the glass cabinet. This is much drier than the cave conditions but it was deemed necessary to prevent the growth of fungus. The Perak Man skeleton was kept under low lighting (less than 50 lux) by covering the glass cabinet partially with an opaque piece of cloth to reduce harmful ultraviolet rays from artificial or natural sources that might activate or cause any photochemical reactions. The skeleton is not kept in complete darkness as this would encourage the growth of fungus.

Storage and Display

The Perak Man skeleton is stored in this specially built glass cabinet at Universiti Sains Malaysia. The preservation condition of the Perak Man skeleton is constantly monitored for insect, fungal or any other sign of deterioration. Some fungal growth was observed during a period of heavy rain. This was due to a higher level of ambience relative humidity. The fungal growth, however, was

immediately stopped and removed with a mixture of water and alcohol, and the relative humidity was corrected to the 45-50% level quickly with silica gel placed in the glass cabinet.

The Perak Man skeleton had received wide attention and frequent requests from in and out of the country for exhibitions. He was exhibited in 1997 in the National Science Museum in Tokyo for a period of one month. In order to safeguard the original skeleton, we had two sets of replicas made and the original is carefully preserved. Numerous exhibitions in the country have seen the replica being used in order to minimise handling of the original skeleton. Whenever the original Perak Man skeleton is needed for further studies or exhibitions, special care and security are taken during transportion, handling and display.

Plans are currently underway for long term storage and display of the Perak Man skeleton at the newly built Lenggong Archaeological Museum in Kota Tampan, Lenggong, Perak. This site museum was established to display to the public the results of archaeological research and excavated artifacts from the Lenggong Valley. The museum is easily accessible to the public as it is located near a highway that leads to major cities and towns in Malaysia. The museum has a number permanent staff to care for the exhibits and houses a site laboratory as well as storage facilities for archaeological artifacts. There is also a plan to build a special room with constant temperature, relative humidity, and lighting suited for long-term conservation and display of the original Perak Man skeleton.

Conclusion

The Perak Man skeletal remains have been conserved and preserved at Universiti Sains Malaysia for about 12 years now (1990-2002), with no visible

deterioration of the skeleton. The methods used for the removal, transportation, reconstruction, and conservation of the Perak Man skeletal remains use simple tools and easily available chemicals. These methods do not require the use of expensive laboratory equipment and do not involve high cost expenditure. The method of storage allows easy access to the skeletal remains for further studies and exhibition. All that is required is daily visual monitoring of the skeletal remains for any sign of deterioration and quick action to deal with any changes. The method of conservation and storage has proven to be a viable and effective method for long-term preservation and storage of ancient human skeletal remains, particularly in hot and humid tropical regions of the world.

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