

# Cranial Surgery in Ancient Mesoamerica

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The word “trepanation” comes from the Greek *trypanon*, which means “drill”. In medical literature, trephining is commonly defined as a surgical operation of the skull cap for therapeutic purposes, meaning the intentional aperture of the skull by means of different drilling, attrition and cutting techniques (Table 1).

**Table 1: Techniques employed in trephining**

1. Drilling
  - simple drilling
  - multiple drillings (forming a ring)
2. Abrasion
3. Incision (simple, polygonal, circular/oval)
4. Combined techniques

In turn, the anthropological definition of trepanation is an intentional and planned opening of the skull, carried out with instruments designed for this purpose (Campillo 1994:41-42; Pahl 1993:20-22). This operation is distinct from cephalic surgery, which is destined to operate on the tissues inside the skull. Not included in this definition are posthumous cranial apertures, like trophy skulls, for example. It can be difficult to detect and confirm trephining from the osteological record alone.

Traditional trepanation’s consequences vary from the immediate death of the patient to his short or long-term survival, and the signatures it leaves range from orifices of different shapes and sizes to healed traces of the procedure. These marks are what anthropologists study to interpret or infer biocultural patterns and practices. Evidence of cut and perforated skull vaults are known from many parts of Mesoamerica. They are represented as hanging from rulers’ hips or found among the funerary outfits of important dignitaries. Apart from trophy skulls, human crania were employed during Prehispanic times as prime material for the production of bony implements, amulets and objects of personal adornment.

## Ancient and Traditional Cranial Surgery

Trephining has been known in many parts of the ancient world and is still practiced in a few traditional communities of Africa, Melanesia and Polynesia. The practice apparently goes back to the Neolithic. The most ancient evidence was reported only recently. The seven thousand-year-old skull from Ensisheim, France (Walker 1997) shows two healed perforations of up to 9 cm in diameter. The specimen belonged to a male adult of around fifty years of age at death. More

recently, trephining is documented for the Aymara in the Bolivian highlands. K. Oakley (*et al.* 1959) report that, until recently, shamans employed traditional skull opening in post-traumatic treatments with strong religious connotations.

In the New World, trepanation was probably practiced mostly among Andean societies. The ancient practitioners used abrasion and cutting, simple drilling and composite perforations (Fig. 1). The hundreds of trepanated Precolumbian Andean skulls exhibit single and multiple perforations. An alternative method consisted of the cauterization of the previously exposed skull surface. For cutting, ritual knives called *tumi* were used, made of copper or gold (Fig. 2). Considering the harsh operating conditions, short term and long term survival was astonishingly high. Resting on the evidence of healing of the skulls, less than 30 per cent of the individuals died immediately after the operation (Verano 1997). Interestingly, the artificial openings are closely related to skull trauma, testifying to its importance as a therapeutic measure (Verano 1997).



Fig. 1. Mummified trephined skull from Peru (photograph by Pedro Weiss, courtesy of Arturo Romano).

### Trephining in Mesoamerica

Compared to Andean culture, there is scarce evidence of trepanation in the skeletal record of Prehispanic Mesoamerica. This may explain why regional research has not really centered around this ancient practice. In 1897, Carl Lumholtz was the first scholar to publish a study on trephined skulls from the Tarahumara mountains. Years afterwards, Javier Romero reported nine cases of artificial opening from Pino Gordo and Narachic, Chihuahua, (already recorded by Lumholtz), from Monte Albán and Tilantongo, Oaxaca, and from Tlatilco in the State of México (Romero 1970, 1974). While there is no doubt about the cultural origins of most cases, the two specimens from Tlatilco are still debated. Some important research on this topic has been conducted recently by Lourdes Márquez (*et al.* 1992) and Richard Wilkinson (*et al.* 1975a, 1975b) at Monte Albán in Oaxaca. In the meantime, Zaid Lagunas (1970, 1972) focused on the so-called “supra-inial trepanation”, i.e. the attritioning of the back of the head in skulls from Cholula, Puebla. Additional potential cases of trepanation are documented for other Mesoamerican cultures,



Fig. 2. “Tumi”, Andean knives employed in cranial aperture (photograph by Pedro Weiss, courtesy of Arturo Romano).

most noticeably the Maya area. Weiss argues for the presence of supra-inial lesions in Guatemala (Weiss 1967, 1981). According to the skeletal evidence, the first technique to be employed in skull opening was abrasion, which was combined later with drilling and cutting (Romero 1974).

Some historical sources, recorded during Colonial times, might well allude to the practice’s ritual and therapeutic importance. Sahagún (1977:585-586) mentions that, to cure headaches, it was recommended to perforate the head with a knife and let it bleed. Diego de Landa (1982) documents its use in Yucatan to alleviate the pain caused by compression boards during head shaping (Landa 1982:54). The historical reports leave us to speculate on trepanation techniques and instruments, its effects and motivations within the frames of Mesoamerican world views and everyday life.

## Cranial Trephining in Southern Mesoamerica

The skulls that will be described in the following paragraphs were studied by the author between 1995 and 1999. They come from the Classic site of Monte Albán in Oaxaca (250-800 AD) and the Maya area (Tiesler 1999).

### Trephining Among the Inhabitants of Monte Albán, Oaxaca

The seven trephined skulls under study pertain to adults of both sexes from the Classic site of Monte Albán. Some showed single perforations, others multiple ones. To effect them, the Zapotec practitioners perforated the bony vault or cut obliquely through it, resulting in round or ellipsoid apertures. For the former, a hollow drill was used, as shown in the multiple trepanation shown in Figure 3, which was left unfinished, perhaps an indication of the fatal end of the operation. In around half of the orifices, the healing of the open wound was accompanied by a bony reaction, evidenced by osteophyte formation and bone remodeling suggestive of post-operative survival (Fig. 4).



Fig. 3. Two cultural orifices in different states of healing, Monte Albán, Oaxaca (Centro INAH Oaxaca).

Apparently, there was a strong anatomical preference for the upper portions of both parietal bones, as these pieces were the only ones that show perforation. As in the cases reported from Peru, most of the trephined skulls bear signs of unhealed cranial trauma, possibly the cause of the operations.



Fig. 4. Multiple trepanation effected with hollow drill, Monte Albán, Oaxaca (Centro INAH Oaxaca).

### Potential Cases of Trepanation Among the Ancient Maya

Quite different from Classic Oaxaca, in the Maya area there is no confirmed case so far of trepanation by cutting or drilling. The lack of evidence suggests that these techniques were not performed among the ancient Maya. Apart from these approaches, some vestiges of occipital abrasion were encountered in different states of healing in the skulls of four subadults from the northern part of the Peninsula dated to the Postclassic. In each case, the modification appears as the result of an abrasive action conducted on the back of the head, resulting in the thinning or complete perforation of these areas as part of the therapeutic process.

The abovementioned lesions are quite similar to the supra-inial lesions reported by Weiss and Lagunas (Figura 5). They are defined as regular pitting or complete penetration of the outer and inner bone layers right above the inion. Various Prehispanic skull specimens display this mark, mostly dated to the Postclassic. They come from Cholula, Puebla; El Zapotal, Veracruz; Juchitán, Lidchi-Bigu and Monte Albán, Oaxaca; Teopanzolco, Morelos; and Teotenango, State of México. In the Maya world, supra-inial lesions are documented from Palenque and Lago Lacandón, Chiapas; the Cenote Sagrado of Chichén Itzá, Yucatan, as well as Zaculéu and Izicuai in Guatemala. Weiss (1967) found similarities between the latter cases and the supra-inial trepanations known among Peru's Chancay and Chimú. Their natural mummification permitted observation of the healing process of the skin on top of the bony lesions and the destruction by abrasion, evidencing the intention-



Fig. 5. "Supra-inial lesion" in the occiput of an artificially shaped skull from Playa del Carmen, Quintana Roo (Centro INAH Yucatan).

al origins of these lesions, which were inflicted during childhood (Weiss 1981:206; 1967:24-25).

While we don't know the role of this painful practice among the Maya or other Mesoamerican cultures, there is ample evidence of its anatomical association with the compression planes left from the artificial shaping of infants' heads. Together with the time in life these traditions were applied, this association may well indicate that both practices, i.e. head shaping and occipital abrading, were accomplishing similar purposes and constituting related cultural expressions in ancient society.

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