



Facial preservation following extreme mummification: Shrunken heads



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ABSTRACT

Shrunken heads are a mummification phenomenon unique to South America. Ceremonial *tsantsa* are ritually reduced heads from enemy victims of the Shuar, Achuar, Awajún (Aguaruna), Wampís (Huambisa), and Candoshi-Shapra cultures. Commercial shrunken heads are comparatively modern and fraudulently produced for the curio-market, often using stolen bodies from hospital mortuaries and graves. To achieve shrinkage and desiccation, heads undergo skinning, simmering (in water) and drying. Considering the intensive treatments applied, this research aims to identify how the facial structure can alter and impact identification using post-mortem depiction.

Sixty-five human shrunken heads were assessed: 6 ceremonial, 36 commercial, and 23 ambiguous. Investigations included manual inspection, multi-detector computerised tomography, infrared reflectography, ultraviolet fluorescence and microscopic hair analysis.

The mummification process disfigures the outer face, cheeks, nasal root and bridge form, including brow ridge, eyes, ears, mouth, and nose projection. Melanin depletion, epidermal degeneration, and any applied staining changes the natural skin complexion. Papillary and reticular dermis separation is possible. Normal hair structure (cuticle, cortex, medulla) is retained. Hair appears longer (unless cut) and more profuse following shrinkage. Significant features retained include skin defects, facial creases, hairlines and earlobe form. Hair conditions that only affect living scalps are preserved (e.g. nits, hair casts). Ear and nose cartilage helps to retain some morphological information. Commercial heads appear less distorted than ceremonial *tsantsa*, often presenting a definable eyebrow shape, vermilion lip shape, lip thickness (if mouth is open), philtrum form, and palpebral slit angle. Facial identification capabilities are considered limited, and only perceived possible for commercial heads.

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1. Introduction

Head shrinking was formerly a ritualistic war trophy custom notoriously practiced by the Shuar, but also the Achuar, Awajún (Aguaruna), Wampís (Huambisa) and Candoshi-Shapra. These inter-related cultures inhabit the Amazon rainforest in the southern lowlands and eastern montaña of Ecuador and northern Peru [1–3]. They were originally a means of appeasing the victor's ancestral spirits, following a long tradition of feuding and blood revenge [1–3]. Its design was intended to trap the enemy spirit in the head by pinning the mouth (the central orifice for respiration and speech), so to demobilise it from escaping and sorting revenge against a chosen individual, most likely (but not always) its killer;

and to suppress and enslave the spirit via shrinkage, where it was believed to work as a talisman for the victor's community till its potency had perceivably depleted (typically following 1.5–2 years) [1–3]. Once exhausted of power, the head was subsequently disposed, kept as a keepsake, or since the mid-19th century, exchanged with European goods for the curio-market [2–5]. Culturally referred to as *tsantsa*, this paper designates these heads as ceremonial *tsantsa*.

Since 1872, there was an emergence of shrunken heads being produced specifically for the curio-market by outsiders to the Amazon head shrinking cultures [2,6]. These are described as commercial shrunken heads. They were produced en masse across much of South and Middle America, using human corpses or animal skins designed to resemble human shrunken heads; often produced by low-earning doctors, mortuary technicians and taxidermists, who had ready access to the deceased (typically via hospital mortuaries and graves), contemporary surgical

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equipment and gloves [2,3,5]. The majority (estimated up to 80%) of shrunken heads circulating private and public collections today are understood to be commercial [7,8].

Reports offering a chronological sequence on how head shrinking was performed can be contradictory, due to it being largely dependant on second-hand information collected during the 17th to mid-20th centuries [9]. As an overview however, head shrinking was achieved by first removing the skull and internal tissues, thus only retaining the skin [1–5,9,10]. The eyelids, mouth and incision made for skull removal were fastened shut. The skin was entered into a cooking pot filled with river water and placed over a fire. As the water reached temperatures over 63 °C, the skin's collagen begins to contract and shrink, allowing the head to reduce to a third its original size [11–13]. Once the water reached near boiling point, the skin was immediately removed to avoid scalding the skin (resulting in tissue splits) and hair roots (causing hair loss). To desiccate the skin, a fire-heated pebble was dropped into the head through the neck opening (traditionally supported by a ring of flexible vine), where it was rotated to sear the internal skin. As the pebble cools, it was replaced with another hot pebble. Once the head was too small for further pebble insertion, hot sands were successively applied until the head was fully desiccated; the head being typically reduced to approximately one fifth its original size. During desiccation, ceremonial shrinkers would iron the outer face with a hot flat pebble to help cure the external skin while singeing away the light vellus hairs that cover the face and are emphasised dramatically by shrinkage [1–5]. Carbon ashes were also smudged into the skin to darken its complexion. To conclude, a suspension cord was traditionally applied at the head's vertex [1–5]. Commercial shrinkers would sometimes prepare heads identically to ceremonial *tsantsa*, but most were prone to deviate from traditional methods and produce more variable results. Table 1 details common characteristics that distinguish commercial shrunken heads from ceremonial *tsantsa* [2,3,5,9,14–17].

Shrunken heads demonstrate an extreme form of mummification. Considering the intensive treatments applied and degree of

shrinkage achieved, this research aims to identify what biological components are successfully preserved, and how this might vary between ceremonial *tsantsa* and commercial shrunken heads. Lacking skeletal information, this investigation will incorporate a series of forensic enquiries on the retained mummified skin, which can be relevant to other aspects of mummy studies. Analytical techniques include infrared reflectography (IRR), ultraviolet fluorescence (UVF), multi-detection computerised tomography (MDCT) and microscopic hair analysis. The prospect of DNA and further elemental analysis will also be discussed, though was not accessible for this study. All available findings will indicate how head shrinking impacts human identification, while utilising a proposed method of post-mortem depiction.

2. Materials

Sixty-five shrunken heads were accessed, 44 from Science Museum London (UK), 20 from the Smithsonian Institution (USA), and one from Elgin Museum (UK). In a previous article by Houlton and Wilkinson [17], utilising the same collection, a detailed forensic analysis using existing morphological standards of differentiation [2,3,5,9,14–17] identified 6 ceremonial *tsantsa*, 36 commercial shrunken heads, and 23 heads of ambiguous origin. Ambiguity is assigned to those that demonstrate a close affiliation to ceremonial *tsantsa*, but present minor morphological anomalies or have atypical/ethnographically unreported materials attached.

3. Methods

To avoid surface contamination, latex gloves were required to handle each head. To mount heads for image capture, a stand cushioned with white acid-free tissue paper was utilised; metal hairpins prevented any scalp hair from covering the face. Each head underwent basic manual macroscopic inspection and the following:

Table 1
Classic characteristics that distinguish Ceremonial *tsantsa* from Commercial shrunken heads [2,3,5,9,14–17].

Ceremonial <i>tsantsa</i>	Commercial shrunken head
1. Long narrow face, often presenting a 'pinched' impression at the temples, a forcibly upturned and spread nose, and intentionally distended lips, creating an elongated profile with a sloping brow and receding chin	1. More convincingly proportioned face and an upright profile. Rounded to domed shaped scalp
2. Size approximately a fifth of a full scale head, equal to a clenched human fist	2. Variable scale
3. Vertical skull-removal incision located from posterior median of head to nape of the neck	3. Variable skull-removal incision locations
4. Sutures are often wide and uneven – performed using a thick and inflexible flat bamboo needle with coarse chambira fibre	4. Stitches are usually more precise, discrete and consistent – due to access to finer, sharper, metal needles and thinner suture threads
5. Sutures are typically made using 'over and over' stitches	5. Sutures are typically made using 'baseball' stitches
6. Loop of flexible vine is sewn into the neck – if absent, traces of suturing can be evident	6. No supporting vine at the neck structure
7. Eyelids are tightly drawn into the head and sutured shut	7. Variable, but the eyelids are often carefully sutured to retain their visible form; often with the upper lid positioned over the lower lid
8. Three mouth perforations from chonta pin application – sometimes retained and lashed together with chambira	8. No, or a variable number of perforations mark the mouth. If pins are present, they are not always chonta wood
9. The mouth pins are classically replaced with intricately woven string tassels applied to the mouth at a length equal to the scalp hair. Several horizontal red bands of achote are painted, but these can fade over time	9. Tassels are often not attached. If present, atypical colourants, materials and knots for securing them may be present
10. Skin browned using carbon staining	10. Skin sometimes remains unstained, presenting as a grey or yellow colour
11. Vellus downy hair removed	11. Vellus downy hair is sometimes maintained, or shaved/trimmed to a stubble
12. Skin is polished	12. Skin can sometimes present a dull, rough texture
13. Skin tends to be dense and of considerable weight	13. Skin can vary; it can sometimes be thin, fragile and very light in weight
14. Typically long scalp hair is present, with no facial hair	14. Scalp hair can vary in length. Facial hair is often maintained
15. One or two perforations mark the crown, with one fitting a vegetable fibre string suspension cord (woven into a five-loop braid) that is secured within the head by a small wooden pin. The cord is long enough for adornment about a person's neck	15. Heads are not always perforated to fit a cord. If cords are fitted, they can be produced from a variety of different materials, woven differently, overly decorated, and of an inappropriate length for personal adornment around someone's neck
16. Piercings that would typically present at the earlobes were not always decorated. Toucan feather ear danglers and/or wooden tubes/pins are however common	16. Headbands, necklaces and any ornamentation comprising beads, seeds, or portions of seeds are atypical to ceremonial <i>tsantsa</i>

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