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Contents

Cranial Deformations in Prehistoric Populations of Kentucky

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Abstract

Head-binding deformations found in remains from "Fort Ancient" and "Mississippian" Indian sites in Kentucky are described. Similarities between defects in such self-mutilation practices and certain syndromal synostoses are discussed.

Key words: Acrocephaly; Deformation, Factitial; Deformation, Skull; Head-binding; Indian, Fort Ancient; Indian, Mississippian; Oxycephaly; Turricephaly.

Introduction

"As the child's head is flattened its eyes stand a prodigious way asunder . . . the Indians stated that through the deformation their sight was much strengthened and they were able thereby to discern game at a better distance during the chase . . ."[1]

Perhaps one of the most curious of human self-mutilation practices is that of deliberate head deformation. From such activities, the skull has been elongated anterio-posteriorly, squared, mitre-shaped and moulded into what has been classified into as many as 16 major types and numerous sub-types.[2]

The reasons for the development of the custom of inducing such bizarre alterations are interwoven with the cultures involved. In the United States and elsewhere the historical sociocultural dimensions of such practices have been well documented. Intra-societal status is often cited as a primary cause. Examples may be drawn from such diverse groups as the slave-owning tribes of the Chinook and Salishan of the North American North West coast where a deformed head was the badge of freedom, slaves not being permitted to indulge in this practice.[3] Similarly, in the Balearic Islands of the past century, head binding was only practised on the crania of the children of wealthy landowners.[4] Such inalterability of morphology would certainly function to restrict class mobility and serve as a potent signal within the culture as to social rank.

In addition to social rank, aesthetic reasons might also have been a consideration. Many cultures traditionally bound female heads more

often than those of the males. A higher frequency of female skull deformation is particularly found in early agricultural populations of the Eastern United States known as "Mississippian".[5] It has also been suggested that a marked frontal flattening would have been utilitarian, aiding the carrying of loads on the head.[6]

This communication illustrates two forms of induced cranial deformity occurring in prehistoric populations from archaeological sites in Kentucky.

Materials and Methods

Investigations were carried out at two sites in Kentucky:

(1) *Smithsonian Site No. 15BK200:* Remains of an amerind population of mixed agriculture and hunting/gathering people known as "Fort Ancient" (1100-1650 C.E.) from Central Kentucky.

(2) *Smithsonian Site No. 15BA4:* Remains of an amerind population of the "Mississippian" culture (700-900 C.E.) from Western Kentucky.

Results

(1) *Smithsonian Site NO. 15BK200:* The remains from this site included three female skulls exhibiting "bifronto-occipital" deformation. The skull morphology had a narrow frontal bone with only a moderate amount of vertical-occipital flattening. Cephalometric radiographs taken in *norma lateralis* of the Fort Ancient group are illustrated in Figures 1, 2 and 3. The most intact skull, seen in Figure 1, illustrates the marked flattening of the occiput and frontal aspect of the skull (see arrows). Figures 2 and 3 show less complete skulls having similar attributes.

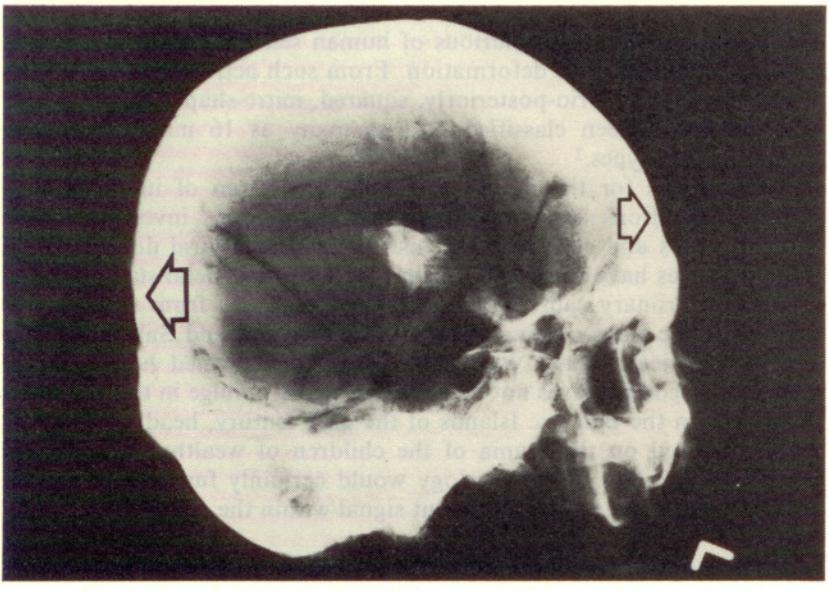

Fig. 1. Specimen No. 1 (Fort Ancient).

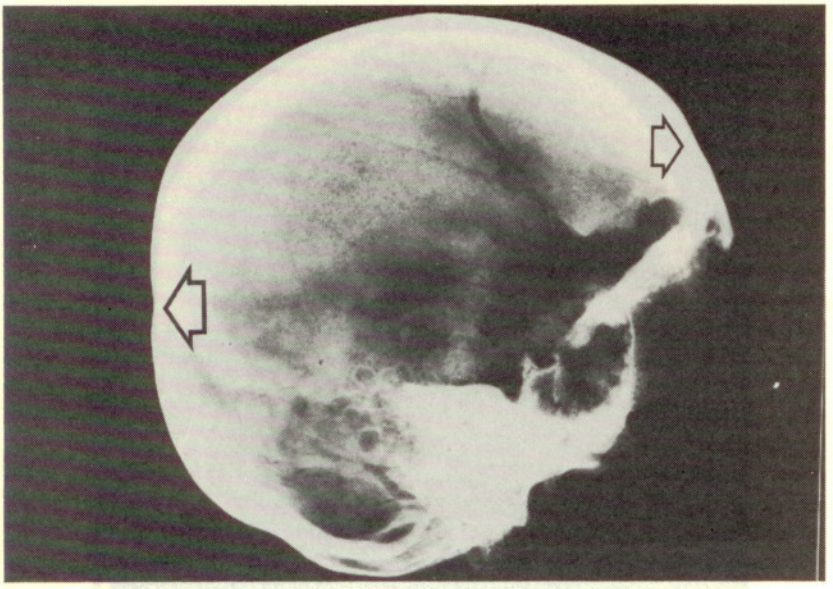

Fig. 2. Specimen No. 2 (Fort Ancient).

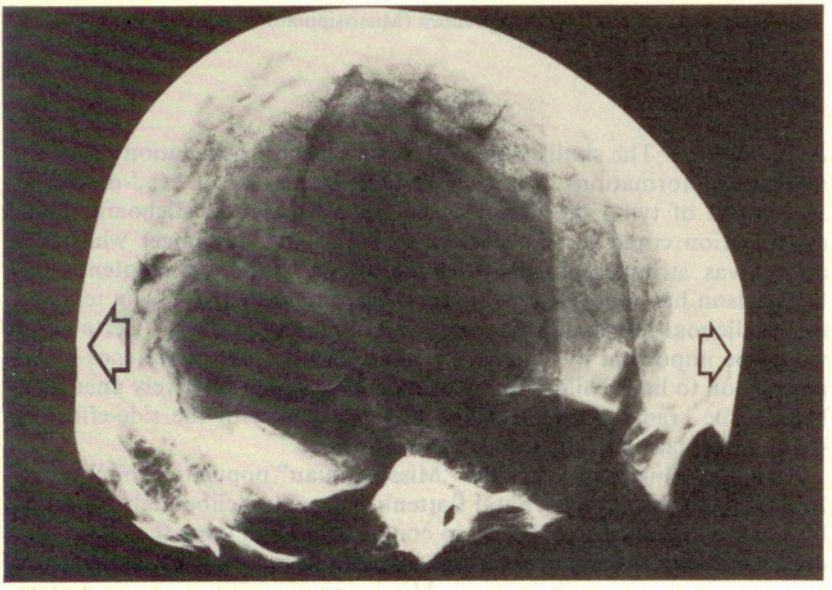

Fig. 3. Specimen No. 3 (Fort Ancient).

(2) *Smithsonian Site No. 15BA4:* Skulls from the Mississippian culture exemplified "fronto-vertical-occipital" deformation. Figure 4 illustrates the severe distortion characteristic of this group.

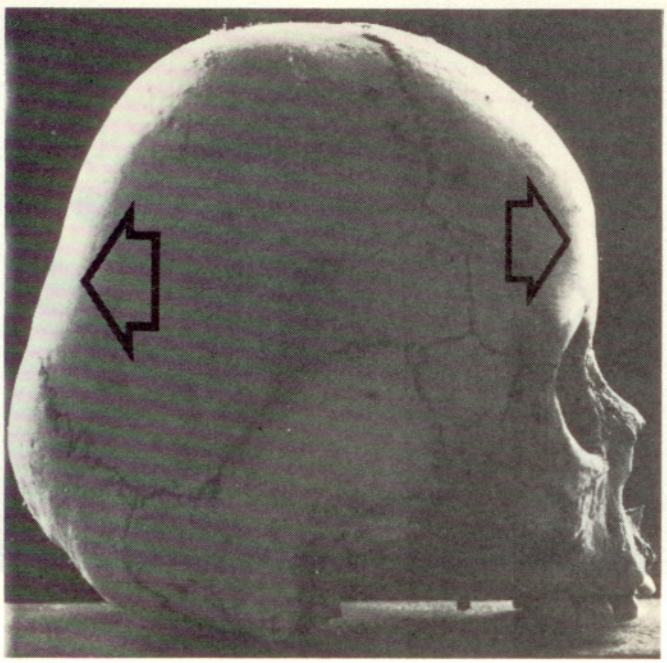

Fig. 4. Specimen (Mississippian).

Discussion

Interpretation: The skulls from the "Fort Ancient" population probably represent deformations caused by "cradle decubitus" or head-moulding as a result of tying the infant's head to a wooden cradleboard. Such modification could have occurred over one year or longer whilst the infant was strapped down. Such deformity could be unintentional. Michaelson has reported that some cultures considered a long term on the cradleboard as favorable for posture and straight legs.[7] Certainly it would be important in a gathering and agriculturally subsistence-based population to have child-bearing women mobile and relatively unencumbered. The cradleboard furnished this freedom with the side-effect of slight deformation of the infant calvarium.

The skull illustrated from the "Mississippian" population of Western Kentucky shows severe frontal flattening, usually deliberately obtained by binding the head to a board, in conjunction with tying the infant to a cradle.[3] Compensatory growth was lateral and superior. Such alteration was extremely common in most Mississippian cultures in the eastern U.S. where the economy was essentially agricultural. Territoriality and land ownership were paramount in those peoples with large supplies of storable grain producing a society with a relatively concentrated population, specialization of labor and elaborate ceremonials.[8] In the society, intentional head binding and advanced ritualization seemed to have flourished together.

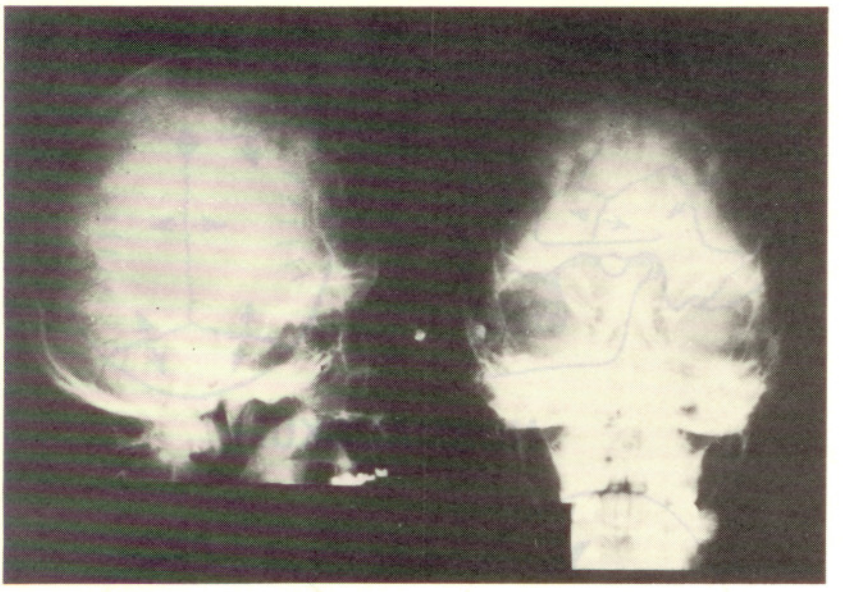

Fig. 5. Syndromal turricephaly (Courtesy of Dr. V. Escobar, Louisville, Ky.).

Comparison between head binding and syndromal turricephaly:

Pathologic premature closure of the cranial sutures known as craniostenosis, or craniosynostosis, can sometimes simulate various types of intentional head distortion. Turricephaly or oxycephaly, which may be associated with any syndrome effecting synostosis of the coronal and lambdoidal sutures (e.g. Pfeiffer's, Crouzon's, Apert's, Carpenter's) can present a very close approximation in general morphology to that of the Mississippian fronto-vertical-occipital deformation illustrated above. The former conditions can possibly be differentiated from head-binding defects, as radiographs of syndromal turricephaly frequently evidences a "luckenschadel" or "beaten silver" appearance of the calvarium (Fig. 5) especially in the frontal area. Fergusen has conjectured that these marks are indicative of pressure from the growing brain on the inner cranial cortex. If indeed full or even partial synostosis of the sutures is present, it seems reasonable that an alternate mechanism of periosteal/endosteal growth and resorption would compensate during osteogenesis. The sella tursica appears shallow as do the orbits. Apparent exophthalmos can be evident in such individuals due to the effect of the pressure phenomena displacing the greater wings of the sphenoid, which are projected anteriorly from a normal position in the middle cranial fossa. This impingement thereby reduces the size of the orbits. Hypertelorism may be evident if intracranial pressure has forced the ethmoidal plate downward and forward.[10]

Figure 6 illustrates the probable effects of a loss of coronal and lambdoidal sutural development resulting in a broadened and towering skull. Simple differential timing of the closure of assorted cranial

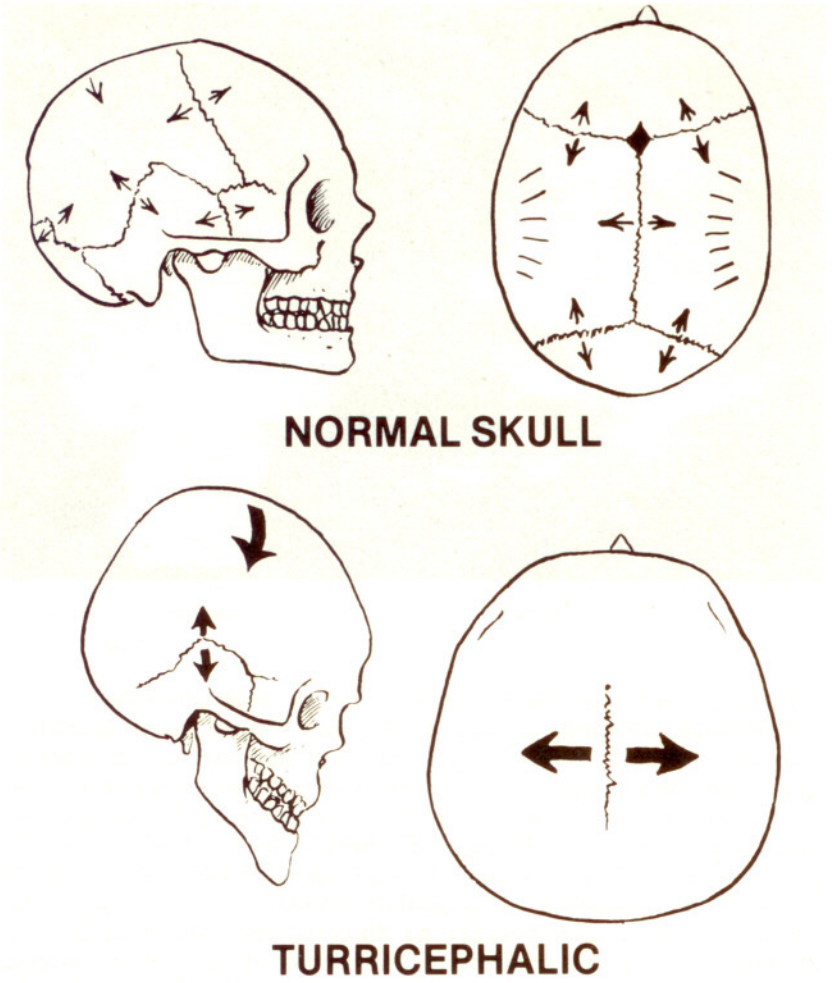

Fig. 6. Early closure of coronal and lambdoidal sutures results in a broadened and towering skull (turricephaly).

sutures presents an explanation for normal racial and individual morphologic variations such as brachycephaly, scaphocephaly or the asymmetric plagiocephaly.[10]

Although binding the head does not cause premature sutural fusion,[9] the same growth sites could not be indirectly affected in response to the expanding brain which displaces the bones of the skull outward, in the direction of least resistance.[11] This movement produces tensile forces at the sutural edges resulting in new bone formation at these sites. Rather than altering sutural patency, binding of the head results in limitation of growth in the desired dimension, by simple mechanical constraint. Compensatory growth occurs in a direction accommodated by those sutural areas which are unencumbered.

Conclusion

Although a case of turricephaly with partial synostosis of the coronal and lambdoidal sutures can superficially resemble fronto-vertical-occipital deformation, the forensic investigator should recognize that only the latter would present the sharp angulations seen at the edge of the head-binding site. Craniosynostosis would not be evident. Either can present distortion of the cranial base or hypertelorism depending upon the severity of craniosynostosis or the apparent enthusiasm of the headbinder.

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Palatal Rugae as Chernoff Faces

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Abstract

A method of representing multivariate data as cartoon faces was originated by Chernoff (1971). It is useful for a first look at or overview of a set of data. The ruga pattern is a complex structure which under purely visual observation is meaningless, and as a set of data it also says nothing to the casual observer. As a Chernoff face, however, the visual impact is immediate. Palatal rugae as Chernoff faces have now been used to try to establish family groupings and possibly to identify the parentage of a child. Three families out of a sample of 17 were randomly selected. Ruga pattern classification was carried out and 10 of the variables which are not affected by growth were used to draw faces. Twenty-four observers were asked to match each child with a set of parents. The number of correct matchings were then counted, as were the incidences of similar matching correct or incorrect. It was found that matching was easier in certain families (observers consistently achieved higher scores), that the incidence of 2, 3 or 4 correct placings was constant and that observers tended to be consistent in their matching (right or wrong).

Key words: Palatal rugae, Chernoff faces, familial inheritance.

Introduction

Herman Chernoff[1,2] proposed a method for representing a set of multivariate data as a cartoon face in which each variable is assigned to a facial feature, which is useful for a first look at or overview of a set of data, aids in discovering clusters and outliers and shows changes with time. Bruckner[3] refined the procedure and De Waal[4] applied the technique in local circumstances to bodily measurements of southern African suricates. He used the visual impact of the faces to group the animals and create a classification of size.

In this project the palatal rugae classifications of 17 families were used to construct Chernoff faces (Figs. 1, 2) so as to attempt visual match of children and parents, and be in a position to determine paternity quickly and without possessing particular skills.

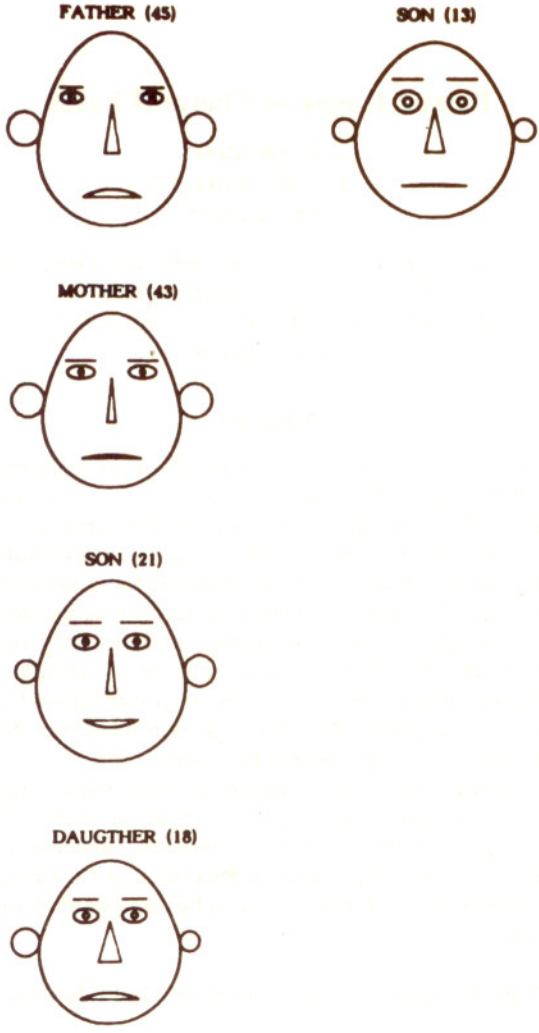

Fig. 1. Family 1: Chernoff faces constructed from palatal rugae of two parents and three children.

Materials and Method

The palatal casts of a sample of 17 Caucasian families were made (Table 1). No individuals wore dentures or palatal appliances of any sort.

The palatal rugae patterns were classified and recorded using the system developed by Thomas and Kotze.[5,6]

The computer programme was adapted to accommodate the 10 variables which are not affected by growth and to trace the faces. These were then transferred to transparent paper thus allowing for superimposition of faces and easier matching. Double blind coding was applied and three families were selected at random for processing (Fig. 3).

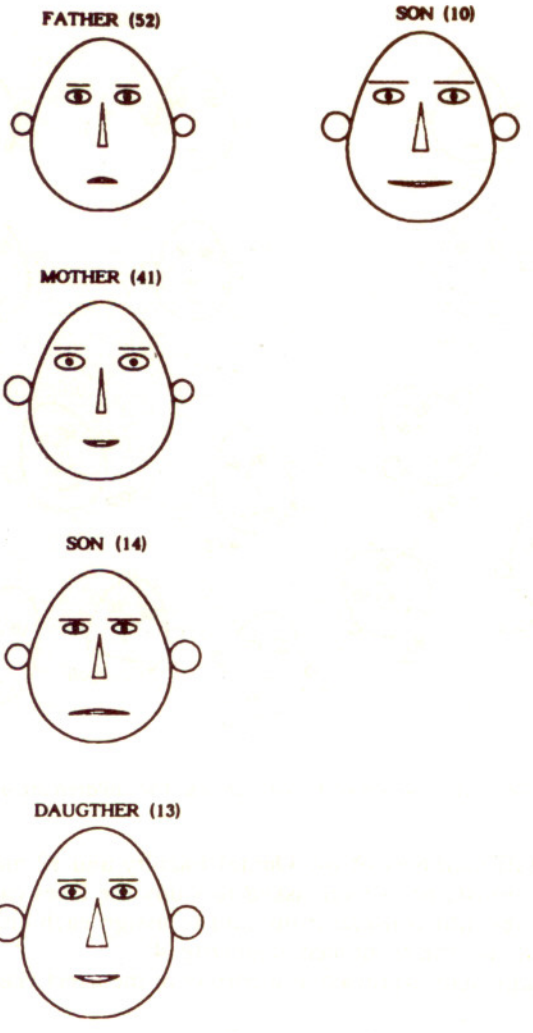

Fig. 2. Family 2: Two parents and three children. The Chernoff faces are obviously different from family 1.

Table 1: Numbers, sex and age of family members

		Sex		*Age*			
	n	*M*	*F*	*Min*	*Max*	*X*	*SD*
Parents	34	17	17	35	58	43,40	5,26
Children	49	30	19	5	21	13,10	4,30
Total	83	47	36				

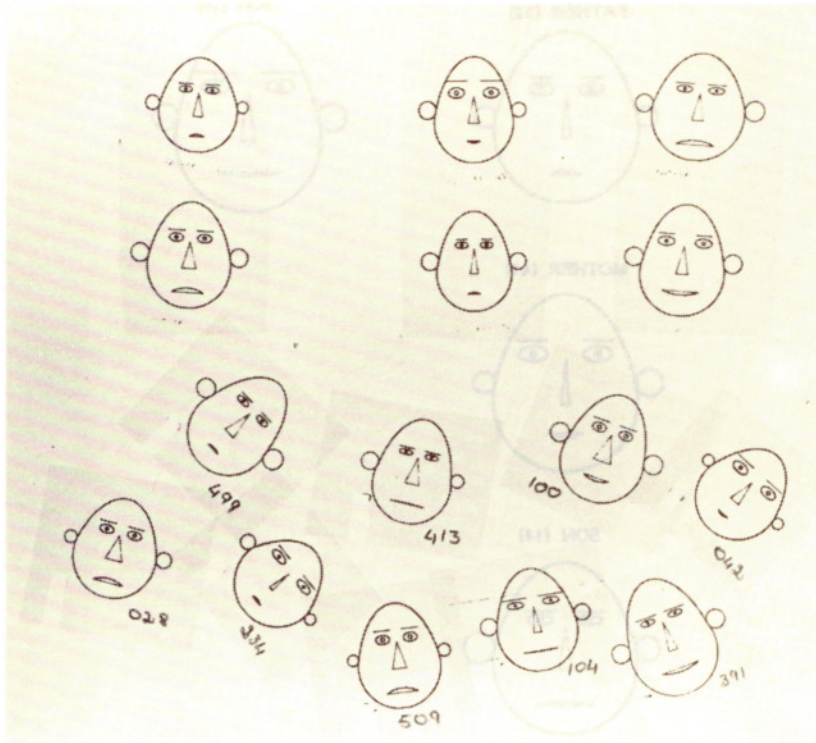

Fig. 3. The three families on transparencies. The children are unsorted.

Twelve staff members of the Dental Faculty and 12 members of the Institute for Biostatistics were asked to study the faces carefully taking all the features into consideration, and to assign each child to a set of parents whom he/she resembled most (FIg. 4).

The findings were expressed as a correct or incorrect classification.

Results

Table 2 shows that family M was better classified than family P which in turn was better classified than family I and that child M503 showed a

Table 2: Number of children per family correctly classified

	No. children correctly classified			
Family	0	1	2	3
I	17	7	0	0
M	3	9	7	5
P	8	5	1	0
Total	28	21	8	5

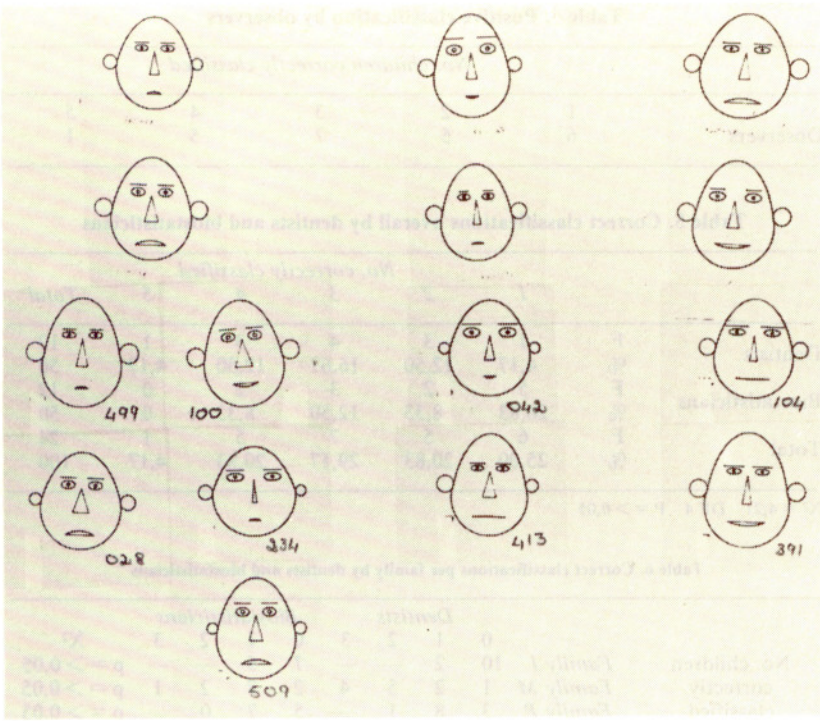

Fig. 4. The children have been assigned to a set of parents.

particularly strong tendency to classify correctly (Table 3). When families were pooled on the one hand and observers on the other (Table 4) only one observer emerged with 5 correct classifications.

The observing capability of the dental staff group against the biostatisticians was studied and given in Tables 5 and 6. There was a trend for the dentists to be more successful but this was not statistically significant. The same trend was evident when the families were separated (Table 6).

Table 3. Individual children correctly classified

Child Code No.	*Correctly classified* *F*	*%*
I 263	1	4,2
I 111	6	25,0
I 215	0	0,0
M 503	15	62,5
M 682	9	37,5
M 761	7	29,2
P 124	7	29,2
P 821	7	29,2
P 232	2	8,3
P 493	8	33,3

Table 4. Positive classification by observers

	No. children correctly classified				
	1	2	3	4	5
Observers	6	5	7	5	1

Table 5. Correct classifications overall by dentists and biostatisticians

		No. correctly classified					
		1	*2*	*3*	*4*	*5*	*Total*
Dentists	F	1	3	4	3	1	12
	%	4,17	12,50	16,67	12,50	4,17	50
Biostatisticians	F	5	2	3	2	0	12
	%	20,83	8,33	12,50	8,33	0	50
Total	F	6	5	7	5	1	24
	%	25,00	20,83	29,17	20,83	4,17	100

$X^2 = 4,21$ DF 4 $P = > 0,05$

Table 6. Correct classifications per family by dentists and biostatisticians

		Dentists				*Biostatisticians*				
		0	1	2	3	0	1	2	3	X^2
No. children correctly classified	*Family I*	10	2	—	—	7	5	—	—	$p = > 0,05$
	Family M	1	2	5	4	2	7	2	1	$p = > 0,05$
	Family P	3	8	1	—	5	7	0	—	$p = > 0,05$

Discussion

The genetic mechanism of inheritance of palatal rugae is very likely a highly complicated and multi-factorial one and to assume that the face (palatal rugae) of a father is the same as that of his children is probably erroneous. However in the practical situation the only feasible approach is to take the tracing at face value, just as tooth attrition as an indicator of age in forensic work cannot always include a consideration of the circumstances of environment and diet which are often not known.[7]

In spite of the abovementioned limitations one family did classify better than others and one child in that family did classify better than the siblings. There thus appears to be a trend but in any case while the children did not classify 100% correctly the procedure cannot hold any practical importance.

The trend for one group of observers to classify the faces better than another is interesting particularly when it is known that that group has a biological background and experience in working with faces and treating the mouth in its facial environment. The difference was however statistically not significant and no practical importance can be attached to this finding. In another exercise six different but uniform population samples[6] whose average palatal ruga configurations had been calculated, were converted to Chernoff faces (Fig. 5). The visual impact of the differences then became immediately evident. It was possible to find

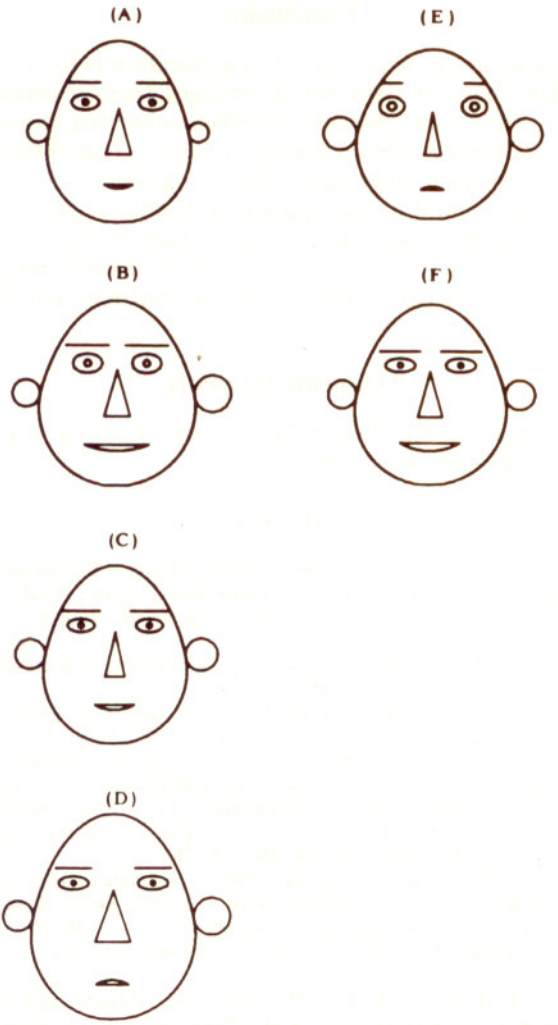

Fig. 5. The Chernoff faces of six race groups constructed on mean values of palatal rugae (A = Negro; B = Caucasian; C = Coloured (Peninsula); D = Coloured (Namaqualand); E = Bushman; F = Indian).

genetic relationships and to reject others which were previously thought to exist. Our previous findings[8] of relatively unmixed gene-sets in Negroes, Caucasians and Bushmen were apparent in the Chernoff faces and the finding that our two Coloured groups were not genetically related but instead that the Coloured (Peninsula) and Indian groups were extensively hybridized was confirmed at a glance in the structure of their Chernoff faces. The similarity of Indian and Caucasian is also noticeable and expected since the Indian is regarded physically as caucasian.

Conclusion

The palatal rugae are eminently suited to application in the Chernoff face technique. The mass of data which emerges from a classification is meaningless to the casual observer but when converted to a set of faces, groupings and trends are immediately apparent. That different groups of observers see the faces differently is a finding which brings subjectivity into the technique, and it is consequently of doubtful practical merit.

While the method is interesting it still remains to be seen whether it can produce results not easily obtained by standard computations on the part of an investigator well versed in statistics and the field of application.

Acknowledgements

We are indebted to Mr. David Wright of Stanford University for preparing the computer programme.

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The Role of the Tongue in Forensic Odontology: A Case Report

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Abstract

A case report is presented in which the tongue played an important role in protecting the teeth from the effects of fire. The cheeks also prevented charring of the posterior teeth and as the tongue underwent heat coagulation at high temperature, impressions of the teeth were made in the lateral borders of the tongue. An external inverted V-shaped cut of the facial soft tissues was evident and exposed the left maxilla and mandible. The mandibular fragment containing the 34 and 35 was found to be deeply displaced into the indurated tongue. Tooth 26 with attached buccal alveolar bone was found loose in the oral cavity and the left condylar process and left zygomatic arch were fractured. The likelihood of these lesions having been produced *before* incineration by a heavy, sharp instrument is discussed.

Keywords: Forensic Dentistry, Tongue, Burn Mortality.

Introduction

During a fire in which a victim's head and face are burnt, the soft facial tissues and tongue, which often protrude, will serve to protect the teeth and restorations from the direct effects of fire and heat. In addition, a crude impression of tooth outlines may be noted in the lateral borders of the tongue.[1]

The destructive action of fire upon teeth varies from case to case. A rapid exposure to flame may result in a bursting fragmentation of the enamel shell leaving only the dentine crown intact. A more gradual exposure to heat may result in a clean separation at the gingival line of the intact crown from the cooler root portion which is encased within the jaw structure. Such crown fractures must not be interpreted as being due to trauma. Prolonged gradual exposure to heat results in brittleness and an ashlike appearance of the dental structures.[1]

If death has occurred before exposure to fire the teeth may remain almost intact due to the protective action of the lips and tongue even though limbs may be destroyed. If the victim was alive at the time of exposure to fire the lips may be drawn apart and scorched black. The facial surfaces of the incisors, canines and premolars are usually affected but not molars which are protected by the cheeks.[2]

Case Report

A grossly charred body was found in a burnt-out car near Umlazi, Durban. The distal aspects of all limbs had been lost and the head and face severely burnt. The following observations were made:

(1) The right body of the mandible was severely charred and the 48, 47 and 46 were absent.

(2) The roots only of the 13, 12, 11, 21, 22, 23, 24 and 25 were found in the maxilla, the crowns possibly having separated from the roots by gradual exposure to heat.

(3) With the exception of the crown of 26 and its attached buccal alveolar bone found loose in the oral cavity, all other remaining teeth were present. The buccal alveolar bone attached to the crown of the 26 measured 13 mm along its horizontal length by 7 mm high.

(4) The upper and lower arches were held slightly apart by the tip and lateral aspects of the tongue which was wedged between the teeth and protected their incisal and occlusal surfaces.

(5) The maxilla and mandible on the right side showed no obvious fractures. On the left side of the face however an inverted V-shaped cut of the soft tissues was evident which exposed the left maxilla and mandible. On closer examination of maxillary molar teeth it was found that the enamel of the 27 had fractured away on the mesio-buccal cusp area. The left body of the mandible was fractured

Fig. 1. Lateral view of fractured mandible showing the fragment containing the 34 and 35 displaced into the indurated tongue.

in three places: Between 33 and 34, 35 and 36 and 37 and 38 (Fig. 1). The mandibular fragment containing 34 and 35 was deeply displaced into the tongue while the fragment containing 36 and 37 was displaced to a lesser degree (Fig. 1). The heat coagulation of the tongue muscle protein caused an induration which allowed clear, permanent imprints of the 34 and 35 crowns (Fig. 2). The imprints made by the 36 and 37 were not so marked. There were no restorations present in the teeth though a moderate to severe amount of attrition was evident. A moderate amount of alveolar bone loss was observed around the teeth.

(6) There was a fracture of the left condylar process 30 mm from the superior surface of the condyle and a depressed fracture of the left zygomatic arch.

Discussion

The left side of the tongue containing the imprint of the crowns of the 34 and 35 was an important feature of the case.

An injury sustained *before* the fire could have resulted in the mandibular fragment and attached teeth being forced into the tongue and causing such marked indentation. As the fire caused the tongue to undergo heat coagulation the bone and tooth fragment became firmly embedded leaving permanent and characteristic marks.

Fig. 2. Lateral view of fragment containing the 34 and 35 and imprints on the lateral aspect of the tongue (arrow).

Conclusion

The likelihood of the lesions on the left side of the face being produced before incineration by a heavy sharp instrument is substantiated by the following observations:

i) An inverted V-shaped cut of the soft tissues reaching both maxilla and mandible.
ii) The crown and attached alveolar bone of the 26 found loose in the oral cavity.
iii) The enamel of the 27 on its mesio-buccal cusp fractured and lost.
iv) The fractured mandible and medially depressed fragment in the tongue.
v) The fractures of the left condylar process and left zygomatic arch.

An ante-mortem lesion of this nature could cause severe bleeding into the oral cavity. At autopsy numerous areas of aspirated blood were indeed observed in the heat coagulated lungs.

I wish to thank Mrs. L. Figenschou for typing the manuscript, Dr. N. Hodges for the photography and Dr. W. A. Aulsebrook for the art work.

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The Rod or Staff of Asclepius

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> It is the nature of the true symbol that its origins are manifold and its meanings operate on many levels; the object or experience which it symbolizes is not fully comprehensible in rational terms; it can be experienced but not explained exhaustively. A symbol whose sense can be fully expressed by means of conceptual language has lost the character of necessity — and hence also its vitality; it becomes a mere allegory.[1]

The rod or staff of Asclepius is the symbol of medicine. It consists of a serpent or snake winding around a staff.

Asclepius (Asklepios [Greek]. Aesculapius [latin]).

Asclepius was the Greek god of medicine, son of Apollo (god of light, truth, and prophecy) and the nymph Coronis.[2] The centaur Chiron taught him the art of healing, but Zeus (the king of the gods), afraid that he might render all men immortal, slew him with a thunderbolt. Homer, in the *Iliad,* mentions him only as a skilful physician; in later times, however, he was honoured as a hero and eventually worshipped as a god. The cult began in Thessaly, but spread to many parts of Greece. Since it was supposed that Asclepius effected cures of prescribed remedies to the sick in dreams, the practice of sleeping in his temples became common.

Asclepius had two sons, Nachaon and Podaleiros. They were also doctors and assisted in the treatment of the injured in the Greek camp during the siege of Troy (more or less 1200 BC).[3]

Asclepius was frequently represented standing, dressed in a long cloak with bare breast; his usual attribute was a staff with a serpent coiled around it (Fig. 1).

The serpent and the rod or staff

The origin of the serpent and tree as symbol in the rod or staff of Asclepius can be interpreted in a number of ways and the mythological associations point to many divergent origins.

In one of his letters Hippocrates writes about the Festival of the Asclepiads which was called the "Raising of the Staff". It was held every year and was combined with a pilgrimage to the holy cypress grove of Apollo Kyparissios near the city of Kos. The idea of the staff as a branch from that grove presents itself at once even though this is not explicitly stated in the letter; relatively naturalistic statues of Asclepius show the god with a slightly bent, somewhat gnarled staff evidently

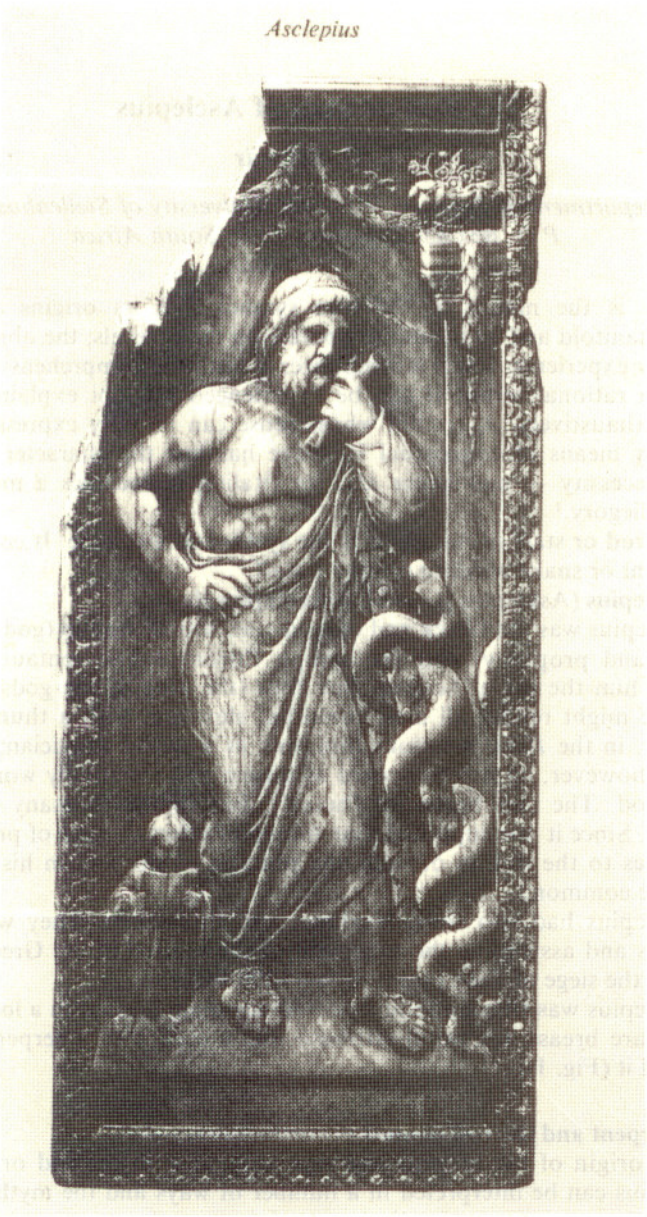

Fig. 1. From a 5th-century AD ivory diptych in the Liverpool City museum. (From: Medical and Health Annual 1977: Encyclopaedia Britannica.)

made from a branch of a tree. The towering, dark, evergreen cypress tree, whose association with graves has remained alive to this day in southern European countries, is a striking symbol of the continuity of life. Associated with this ritual of the Asclepiads at Kos the staff may

thus be understood as a type of symbolic abbreviation for the universal idea of the tree of life and is thus seen in a natural relationship to the serpent winding around it.

The serpent and the tree play an important part in the cosmogony of the most diverse peoples. An old description of the Garden of Eden, or the Edda tells of Yggdrasil, the ash tree whose roots and branches bind earth, heaven and hell and the Midgard serpent. In men's imaginations, however, the beginning was always a Golden Age, a state of original perfection and immediate participation in the divine order, where neither disease nor death reigned. In his longings, suffering man had always looked to a return to this state. Perhaps the interpretation of the staff of Asclepius as a dual symbol of original unity and harmony to which the sick turn is its deepest and most vital sense embracing all other interpretations.

The two most important attributes of Asclepius occur together towards the end of the fourth century in the form of the Aesculapian staff and serpent which has survived to our day as a symbol of the medical profession. This symbol — with its faint reminiscence of the golden age imaged by men since time immemorial — was adopted by the city of Kos with its medical school famous on account of Hippocrates, the pupil of Asclepius.

The serpent or the snake

In 293 BC plague spread throughout Rome. A delegation was sent to Epidauros in Greece where the most important temple of Asclepius stood. The delegation's assignment was to return with a statue or imitation of Asclepius. In the temple they saw a snake and believed that the god had entered the snake. The snake was brought to Rome alive and immediately the plague was brought under control.

The adder depicted on the staff of Asclepius[1] (Coluber longissimus) grows to a length of over six feet and is non-poisonous. A native of southern Europe, it is also found throughout all those countries to which the Greco-Roman culture spread. The adder is found in particularly large numbers in the vicinity of former baths, where they were kept by the Romans. Observers of different epochs all praise the elegance and the attractive and friendly nature of these reptiles. They move swiftly and gracefully and are excellent climbers.

The earth-bound serpent as the companion of several underworld divinities (e.g. the moon-goddess Hecate and the grain-goddess Demeter) has associations with mother earth; at the same time it points to the powers of growth and creativity and is thus associated with the rising light; its solar nature is particularly apparent in representation of winged serpents.[1]

Like the dragon which in many ancient cultures is a largely interchangeable mythological 'synonym' of the serpent, it may embody the destructive as well as life-giving forces of water. The serpent of Asclepius as protector of medicinal springs may be one of the benign aspects of this ancient reptile.[1]

The snake also symbolizes the instinctive and unconscious side of

man: 'The lower vertebrates have from time immemorial been popular symbols of the core of our collective psyche, localized anatomically in the subcortical centres, the cerebellum and the spinal cord. The serpent is composed of these organs'.[1]

Shedding its skin every year, the snake is also an admirable symbol of the perpetual renewal of life, rejuvenation or rebirth, and hence for restored health after a severe disease.[1]

In the most diverse mythologies, serpents and dragons are the preservers of hidden and inaccessible treasures, for instance the golden apple in the garden of the Hesperides, the Golden Fleece and the Nibelungs' treasure. The Biblical serpent and the Tree of Knowledge of Good and Evil is well known. The alchemists had the *serpens mercuri* which is the *prima materia,* an *increatum,* which by a slow process of development is to be changed, refined and spiritualized.[1]

The serpent demonstrates its undiminished currency by its appearance in the dreams of modern man. 'Dreams about serpents occur . . . as a rule in deviations of the consciousness from its instinctual moorings'. In the form of a spiral or a closed circle, however, it may also be a symbol of the centre, the self, origin and at the same time fulfilment as it is seen in many ancient representations winding around the omphalos, the conical stone at Delphi supposed to be the 'navel' of the earth.[1]

The rod or staff

The rod or staff may be seen as the traveller's staff, which reminds us of the long journeys of Asclepius from his home in northern Greece throughout the Hellenic world. It thus symbolizes the inexhaustible willingness of the doctor to travel long and wearisome journeys to cure or help the sick.

In the figure of the enthroned god, whose image had been created by Tharysymedes for the temple of Epidauros, the rod or staff is reminiscent of a sceptre. A connection can also be seen with the magic wand of Hermes, with which he sent sleep and dreams to man, since sleep and dreams play a central part in the incubation rites of the early medicine practised in temples. Characteristically, Hermes too, a messenger of the gods and mediator between the upper and lower regions — Olympus and Tartarus — belongs to that frontier region of sickness and health which the doctor enters in his work of healing. As a phallic symbol the staff doubtless contains also the idea of creativity — particularly from its connection with Hermes and his fetish, the Herm, a long upright stone.

Numismatic aspects of the rod or staff of Asclepius

A silver coin of Zakynthos from the fourth century BC depicts the youth Asclepius caressing one of the two serpents that accompany him. The original and intimate connection between the serpent and Asclepius is attested to by the story which tells of the young god tending the snakes for himself on Mount Pelion, where he grew up under the care of the centaur Chiron.

A silver coin from Epidauros (350 BC) is a faithful representation of the gold and ivory statue of Asclepius which Thrasymedes made for the

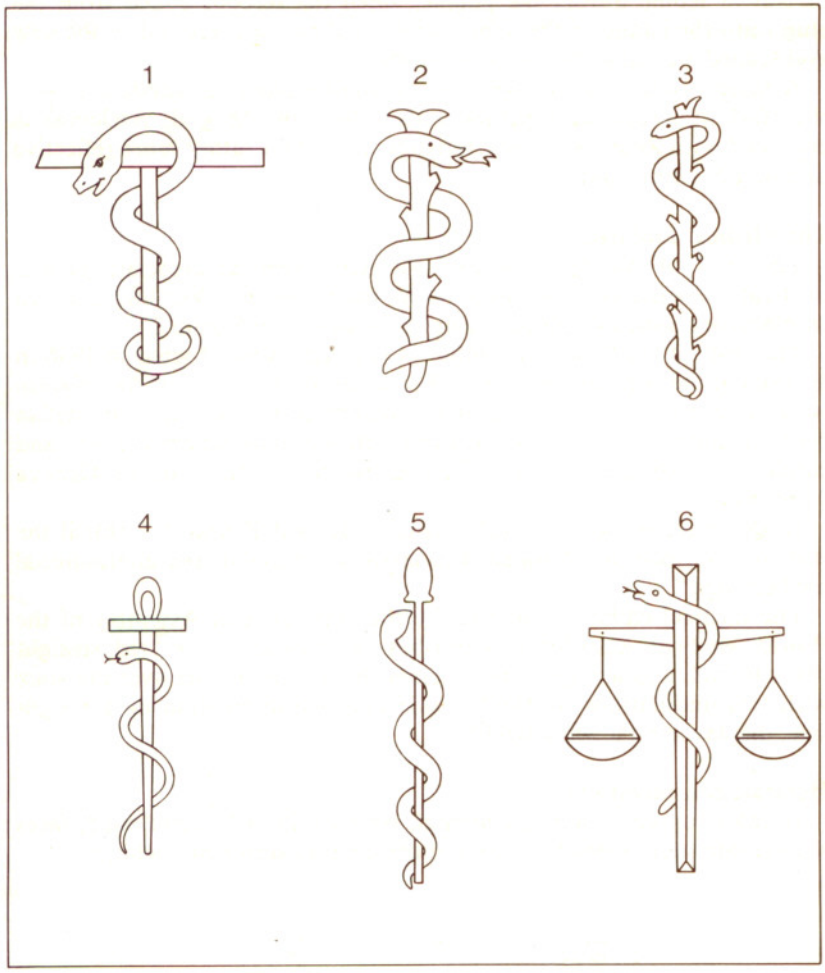

Fig. 2. Various designs of the rod or staff of Asclepius. 1. Emblem of The Royal Society of Medicine London. 2. Emblem of the Medic-Alert Foundation. 3. Emblem of the Medical Student Representative Council of the University of Stellenbosch. 4. From the emblem of the South African Medical Research Council. 5. Emblem of the 'Nederlandse Maatschappij tot Bevordering van de Geneeskunst'. 6. Emblem of Medico-legal endeavour.

shrine in Epidauros — the most important centre at that time of the Asculapian cult. Both attributes occur here indpendently: the majestic figure holding a sceptre-like staff in the left hand while the right is held above the head of a rearing serpent.

On a silver coin from Pautalia dating from the reign of Caracella Asclepius is seen riding on a winged serpent. The wings point to the sun-like character which the serpent sometimes assumes.

A bronze coin from the time of Antonius Pius (AD 138-161) depicts the serpent as the incarnation of Asclepius. It depicts the moment of

arrival in Rome during the plague, when the serpent glided from the ship onto the island in the Tiber, where a shrine was erected to the new god (called Aesculapius by the Romans).

A large bronze coin of Severus Alexander from Alexandria depicts the staff of Asclepius together with a bust of the god. Asclepius is endowed with Zeus-like characteristics, yet with a rather more reflective and milder expression.

The Medical Emblem

The staff of Asclepius is used by many medical associations and medically associated organisations as their emblem. Virtually no two emblems are alike as seen in examples illustrated in Figure 2.

The staff of Asclepius as symbol of medicine was adopted in 1956 in Havana at the 10th General Assembly of the World Medical Association with the object "to be used in providing complete protection to civilian doctors, their assistants and medical defence units which are not and cannot be protected by the Red Cross under the Fourth Geneva Convention.[4]

In the emblem of the South African Medical Research Council the staff is described as "Ansated Tau cross and serpent: the international medical sign".

The medical emblem[4] adopted by the 10th General Assembly of the World Medical Association describes the emblem as a "red straight vertical stick and a serpent represented by a sinuous line over the stick with two undulations on the left side and one undulation on the right side, displayed on a white field".

Heraldic considerations

Heraldic usage is that any animal, unless otherwise mentioned, faces the heraldic right side of the coat of arms i.e. as seen from behind.

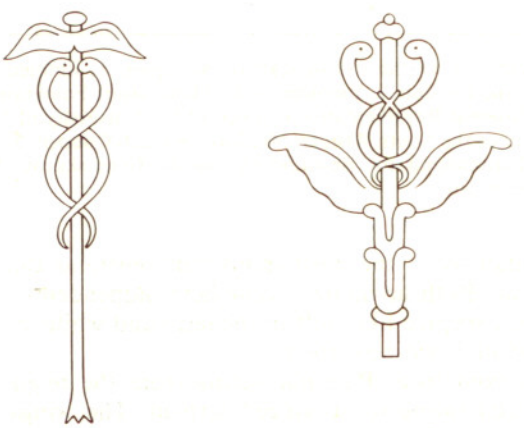

Fig. 3. The caduceus (of Hermes-Mercurius). Left: from a bronze statue of Giovanni Bologna of Italy. Right: From a Roman statue.

The caduceus

The cauduceus (Latin) or kerykeion (Greek) has a winged staff and intertwined serpents and represents the wand of Hermes or Mercury, the messenger of the gods and the patron of trade.[2] Examples of the caduceus are illustrated in Figure 3.[5]

The wand of Hermes and the healing rod or staff of Asclepius are often confused.[5] The caduceus was first used in 1521 by Johan Froeben as medical emblem on the front page of medical writings. Shortly thereafter Sir William Batts, the personal physician of Henry VIII used it as his coat of arms. Three centuries later the publishers J. S. M. Churchill followed Froeben's example.

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