Polymorphism of cranial suture obliteration in adult crania

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"What you get by achieving your goals
is not as important as
what you become by achieving your goals."

Zig Ziglar

Declaration

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution to Manisha Dayal and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

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Signed: _____

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In memory of my Uncle and Aunt,

Parbhoo Kunvar
1954-2008
&
Pushpa Kunvar
1957-2007

Abstract

Cranial sutures are fibrous joints of the skull which allow for growth in young individuals. The sutural ligament is the fibrous connective material found between the two joint surfaces which can be divided into a number of different layers. During embryonic development and growth, ossification centres in the skull allow for the growth and development of the flat bones in the skull. Sutures are the areas where these ossification centres eventually meet. Some sutures like the frontal suture normally disappear at the age of two years, but it has been shown that this suture can persist in adulthood and is then called the metopic suture. Torgersen (1950) has shown that the obliteration pattern of the metopic suture is the same for skulls belonging to common inheritance trajectories. Cranial suture closure has thus been shown to be controlled by genes. In physical anthropology, obliteration of cranial sutures has been used as an age-at-death indicator since 1542. However, in 1890, Dwight rejected the notion that there was any relationship between age and obliteration patterns. Despite this, there have been a number of studies that have continued to use this method to estimate age-at-death from skeletal remains. These methods are currently still being used. The aim of this study was to investigate cranial suture obliteration patterns in adult crania. A total of 490 randomly selected modern black and white South African skulls from the Dart Collection were used to collect data. The ages of the individuals ranged from 19 to 98 years. Two methods previously used to estimate age from skeletal remains were used to assess the final obliteration status of the sutures. The scores assigned to these sutures were then subjected to statistical analyses to explore any relationship between age, sex and population affinity. The results show that considerable polymorphism in the obliteration pattern

of the cranial vault sutures exist. The endocranial scores are bimodal while the ectocranial aspects using both the Acsádi & Nemeskéri (1970) and Meindl & Lovejoy (1985) method are multimodal. Bimodality and multimodality are direct indications of polymorphism. No significant relationship was found between obliteration and age. Thereafter the two methods initially used to assess the sutures were used to estimate the age of the skulls to test these methods. The results show that both these methods are not useful as age estimators when used on individuals drawn from the South African black and white populations. Since the large majority of variation in cranial suture obliteration is not explainable by age, it is hypothesized that patterns of the cranial vault suture obliteration are the result of epigenetic variation similar to that occurring elsewhere on the skeleton, and not a regular result of aging.

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