



Obliteration of Cranial Vault Sutures in Adult Skulls

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ABSTRACT

The cranial vault of the human skull has sagittal suture, coronal suture and lambdoid suture. These cranial sutures are immovable joints of the skull. These joints remain patent allowing the growth of the brain in intrauterine life and early extrauterine life. They also facilitate the passage of fetus during vaginal delivery by non traumatic compression of fetal skull bones. If there is premature fusion of skull bones i.e. cranial synostosis, it leads to skull deformities compromising brain growth. In normal adult obliteration of these sutures starts at middle age continues till old age. The present study was conducted on 35 dried skulls of anatomy museum of GITAM institute of medical sciences and search, Visakhapatnam. Partial obliteration of sutures was observed in 6 skulls. This obliteration was seen in one of the sutures of the vault. suture union first occurs in sagittal suture at middle age and lambdoid suture is the last one that show obliteration. Literature described a skull without sutures. As these bones resist putrefaction they are useful in determination of age in medicolegal cases

KEYWORDS : sagittal suture, synostosis, ossification

Introduction

The bones of cranial vault are fused by sagittal, coronal & lambdoid sutures. Cranial sutures are the fibrous joints of the skull. These sutures allow the overriding of bones during parturition and allow the skull to expand to accommodate the growing brain upto 2 years of age. If these cranial sutures ossify prematurely i.e. before 2 years, the condition is known as cranial synostosis. It changes the growth pattern of skull resulting in altered skull morphology. (1) Cranial synostosis may involve any suture. Based on the suture involved it is classified into sagittal synostosis, coronal synostosis, metopic synostosis and lambdoid synostosis. If cranial synostosis was not treated in children, it will cause abnormal skull growth & raised intracranial pressure that may lead to visual disturbances. In adult skulls ossification of these sutures starts at middle age. It begins endocranially and proceeds ectocranially. First it starts in sagittal suture followed by coronal and lambdoid suture. Fusion of sagittal suture begins at 25 years of age. The present study was focused on the bones of cranial vault of adult skull to see the fusion of cranial sutures. As cranial bones are resistant to putrefaction, they may be used in determination of age in medico legal cases along with femur.

Material & Methods

The present study was conducted on 35 dried human skulls. All the major sutures of cranial vault were observed and obliteration involving any part sagittal, coronal and lambdoid suture was noted.

Observations

Partial closure of the cranial sutures of skull was observed in 6 skulls. Suture closure was seen in sagittal and coronal sutures but not in lambdoid suture.

Sagittal suture : closure of posterior third of sagittal suture was seen in 2 skulls and fusion of middle 1/3 of sagittal suture was seen in 1 skull (Fig.1) & most of the sagittal suture was ossified in another skull (Fig.2)



Fig. 2 closure of sagittal suture

In 2 skulls there was obliteration of coronal suture at its lower part. (Fig.3)



Fig. 3 obliteration of lower part of coronal suture



Fig. 1 fusion of posterior & middle part of sagittal suture

DISCUSSION

The bones of skull are joined by sutural joints. These joints show ossification that begin endocranially and proceed ectocranially. Hippocrates mentioned about variations in skull and suture morphology in his treatise. Herodotus(2) described a skull *with out sutures in 484B.C.*

Andreas vesalius elucidated different forms of cranial synostosis in his book *De humani corporis fabrica*(3)

Ectocranial suture closure sequentially involves sagittal, lambdoid and coronal sutures.(4,5)

Muralimanju proposed grading scale of suture closure in adult skulls and concluded that lambdoid suture is the most patent suture among cranial sutures due to their external forces .i.e muscle pull(6)

Suture grade 0- suture open ,not fused,

grade 1- fused ,but not obliterated

grade 2- less than 50% obliterated

grade 3- more than 50%obliterated

grade 4- 100%obliterated

Dipti padmalaya(7) study on 400 skulls described that isolated absence of sagittal suture doesnot produces a scaphocephalic skull and the same was reported by S.V.Khandare(8) Alves,J.C.et al(9) mentioned that closure of sagittal suture begins at posterior third ,then middle third and finally anterior third of suture.AG Vijay kumar(10) in his cross sectional study described that closure of sagittal sutures starts at middle third proceeds anteriorly and finally involves posterior third of the suture.He also mentioned that closure of coronal suture starts at lower part later proceeds to upper part.At 25years of age sagittal suture starts closing and completes by 35-40years followed by closure of coronal suture that happens between 25-45 years of age and finally lambdoid suture completes its fusion by 50 years.(8)

Conclusion

Sutures of the child skull remain patent upto 2years of age to allow the developing brain . If the suture closures before 2years it leads to skull deformities,where surgical intervention is needed.Normally ossification of sutures starts at middle age, first endocranially and proceeds ectocranially involving sagittal ,coronal and finally lambdoid sutures. So the sutures are more preserved in younger age individuals between 20-35years.

References

1. Slater BJ, Lenton KA, Kwan MD, Gupta DM, Wan DC, Longaker MT (April 2008). "Cranial sutures: a brief review". *Plast. Reconstr. Surg.* 2008 April; **121** (4): **170–178**.
2. Cf. Herodotus, IX.83, where a skull is said to have been found on the battlefield of Plataea which had no sutures at all.
3. Hast MH, Garrison DH (2000) Vesalius on the variability of the human skull: book I chapter V of *De humani corporis fabrica*. *Clin Anat* 13:311–320
4. T.W. Todd, D.W. Lyon jr. Endocranial suture closure. Its progress and age relationship part1. Adult males of white stock. *Am. J. Phys. Anthropol.* 1924; 7:325–384.
5. Krogman WM, Iscan MY. Skeletal age: cranium. In: *The Human skeleton in Forensic Medicine*. Charles C Thomas Publishers 1986; 2nd edn : p.103–132.
6. B. V. Murlimanju, Chandni Gupta, D. Samiullah, Latha V. Prabhu, Mangala M. Pai, Chettiar Ganesh Kumar, M. S. Somesh. Morphological investigation of cranial sutures in Indian human adult skulls *Rom J Morphol Embryol* 2011, 52(3 Suppl):1097–1100
7. Dipti Padmalayam, R. Shane Tubbs, Marios Loukas, Aaron A. Cohen-Gadol. Absence of Sagittal suture doesn't result in scaphocephaly. *Childs Nervous system*, 2013 April; 29(4):673–677.
8. Dr. S. V. Khandare, Dr. A. B. Shinde, Dr. S. B. Punpale. Absence of sagittal suture – an accidental finding. *International J. of Healthcare and Biomedical Research*, Volume: 03, Issue: 02, January 2015, Pages 122–126
9. Alves, J. C.; Wafae, G. C.; Coelho, D. D. P.; Wafae, N.; Coelho, V. D. A.; Pereira, E & Ruiz, C. R. Sagittal suture of the human cranium and the time of closing. *Int. J. Morphol.*, 27(2):469–473, 2009
10. AG Vijay Kumar, Swapnil S Agarwal, Binay K Bastia, Shivaramu MG and Ravindra S Honnangar. Fusion of Skull Vault Sutures in Relation to Age-A Cross Sectional Post-mortem Study Done in 3rd, 4th & 5th Decades of Life, *J Forensic Res* 2012, 3:10