

Observing and grading synostosis of cranial sutures

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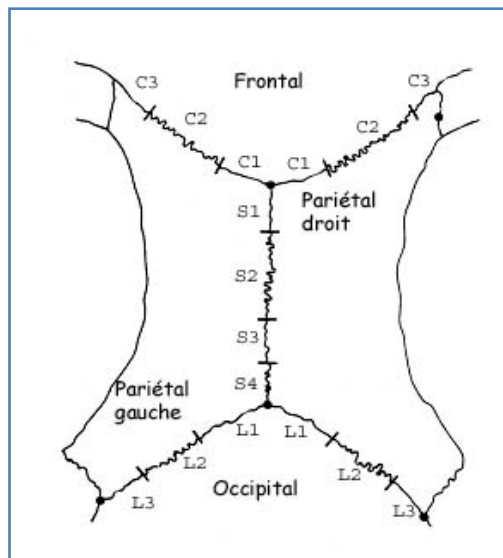
Suture segmentation

The division of segments observed on the sagittal, coronal and lambdoid sutures is that defined by Henri V. Vallois in 1937 and adopted by Georges Olivier in 1960 and Denise Ferembach, Charles Suzanne and Marie-Claude Chamla in 1986.

Following Claude Masset (1982), 10 sutural sectors are selected to calculate a coefficient of cranial synostosis:

- the sagittal suture comprises four segments;
- the coronal suture comprises six segments (three left and three right);
- the lambdoid suture also comprises six segments (three left and three right).

Division into 10 sutural segments
(Source: diagram by Luc Buchet based on Olivier, 1960)



Degree of obliteration

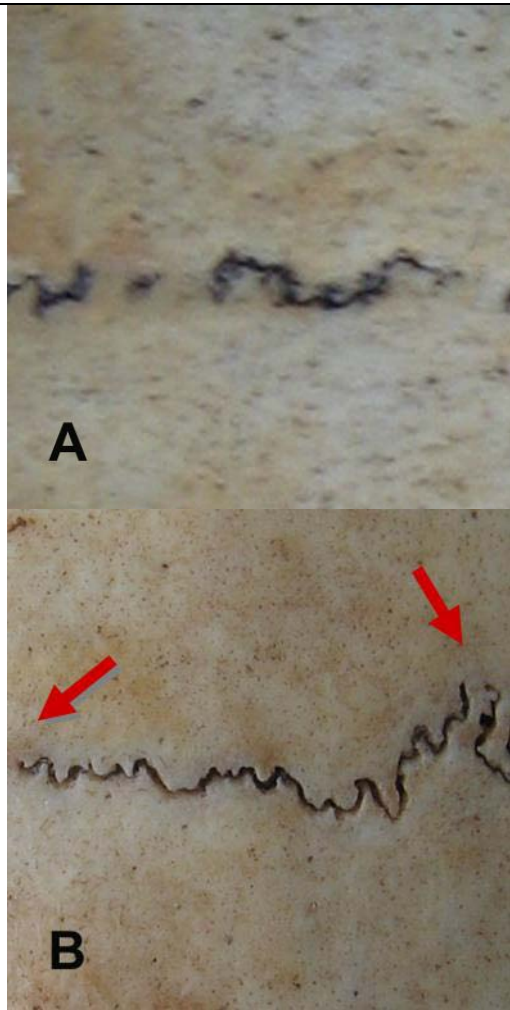
We have adopted the term “degree” to quantify the obliteration in each sutural segment. The five degrees range from 0 to 4, following the definitions of Paul Broca, 1875, adopted by Vallois, 1948; Ribbe, 1885; Frederic, 1906; Martin, 1957; Ferembach and Chamla, 1986.

Degree 0:
open suture, no
synostosis



Degree 1: incipient
synostosis; less than
half the segment is
synostosed (A).

A single fused
section, even very
short, is sufficient for
the segment to be
graded 1 rather than 0
(B).



Degree 2:
approximately half the
segment is
synostosed.



Degree 3:
more than half the
segment is
synostosed.



Degree 4:
suture closed;
complete synostosis.



Coefficient of synostosis

This is calculated from the mean of ten segments.

For the single suture (sagittal), the four segments are counted.

For the paired sutures (coronal and lambdoid), the mean is taken of the left and right segments (C1 l and C1 r; C2 l and C2 r; C3 l and C3 r). Similarly for the three lambdoid segments. Where the state of conservation is poor, one side only may be used; the statistical difference between left and right sides is not significant (see Masset *et al.*, 1990, p. 72-80).

The coefficient is calculated by averaging the degree of obliteration observed on the ten segments (S1, S2, S3, S4, C1, C2, C3, L1, L2, L3).

Where the skull is in poor condition and segments are missing, a coefficient of synostosis can still be calculated since the figure for each segment correlates well (approximately 0.80) with the coefficient obtained for the ten segments (see Masset *et al.*, 1990, p. 123-131).

Observer effect

The principles of observation are simple and should not cause any problems of interpretation. Where more than one person observes the same collection, they can easily test their results and define common rules.

However, where more than one observer uses the method without discussing it in advance, there is a risk that the personal factor will affect the grading and consequently the results.

Citations

BROCA, P. (1875), «Instructions craniologiques et craniométriques», *Bulletins et Mémoires de la Société d'Anthropologie de Paris*, 2, 207.

FREDERIC, J. (1906), «Untersuchungen über die normale Obliteration der Schädelnähte», *Zeitschrift für Morphologie und Anthropologie*, 9, 373-456.

MASSET, C., CASTRO E ALMEIDA, M.E. (1990) - *Âge et sutures crâniennes*. Catania, Atti della Accademia Mediterranea delle Scienze, 276 p.

VALLOIS, H.-V. (1937), «La durée de la vie chez l'homme fossile», *L'Anthropologie*, 47, 499-532.