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Cross-Sectional Atlas of the Human Head

With 0.1-mm Pixel Size Color Images

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Contents

Introduction

1

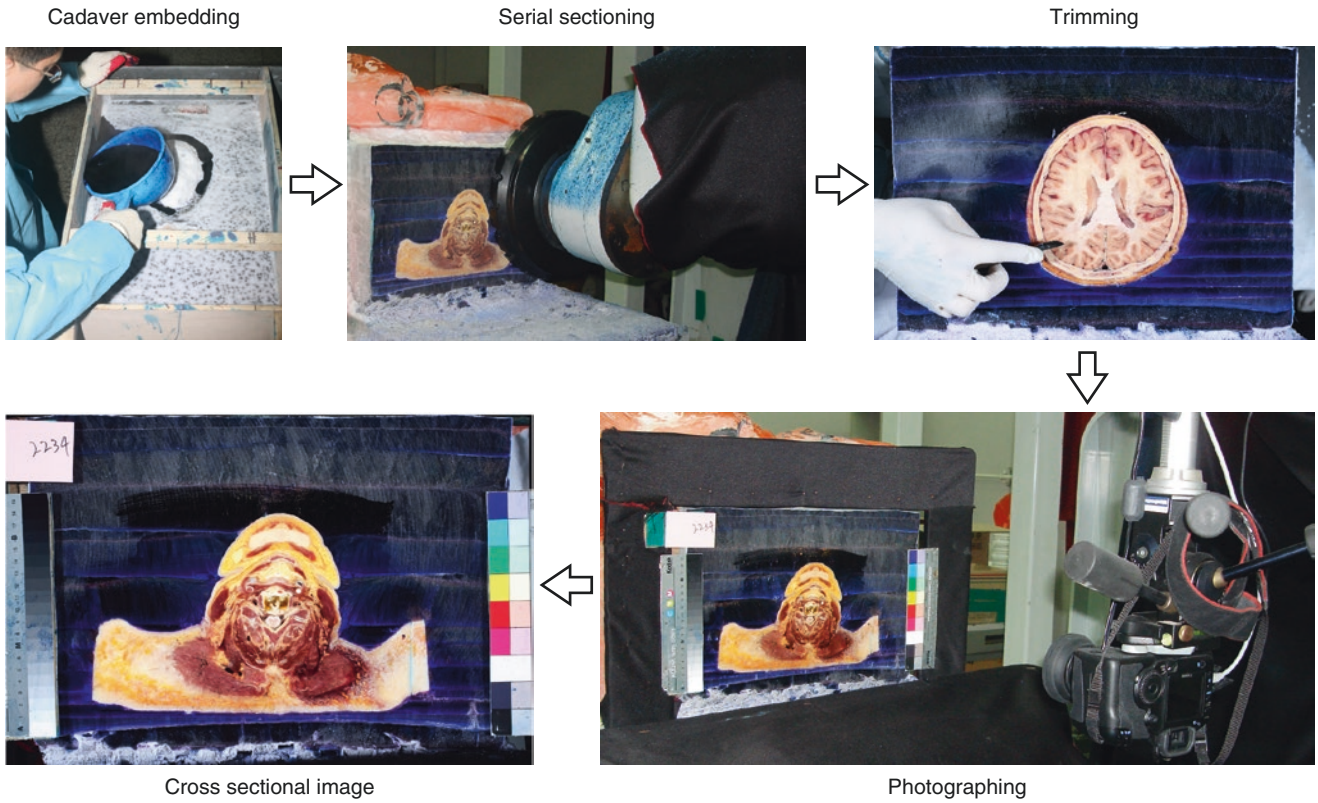
This superb color atlas sets a new standard in neuroanatomy by presenting around 300 detailed thin-sectioned images of the human head, including the brain, with 0.1 mm intervals and a pixel size of 0.1 mm × 0.1 mm. A new reference system employed for this purpose is clearly explained, and structures are fully annotated in the horizontal, coronal, and sagittal planes. Recent advances in 7 Tesla MRI and 7 Tesla TDI have considerably enhanced imaging of the human brain, thereby impacting both neuroscience research and clinical practice.

Moreover, the information gained from initiatives involving photography of thin slices of human cadavers, such as Visible Korean with Visible Human Project and Chinese Visible Human (Park et al. 2009, 2010), has enriched knowledge of neuroanatomy and thereby facilitated the interpretation of such ultrahigh-field-resolution images. The exquisite images contained within this atlas will be invaluable in providing both researchers and clinicians with important new insights.

J.S. Park, *Cross-Sectional Atlas of the Human Head*, https://doi.org/10.1007/978-981-10-0770-5_1

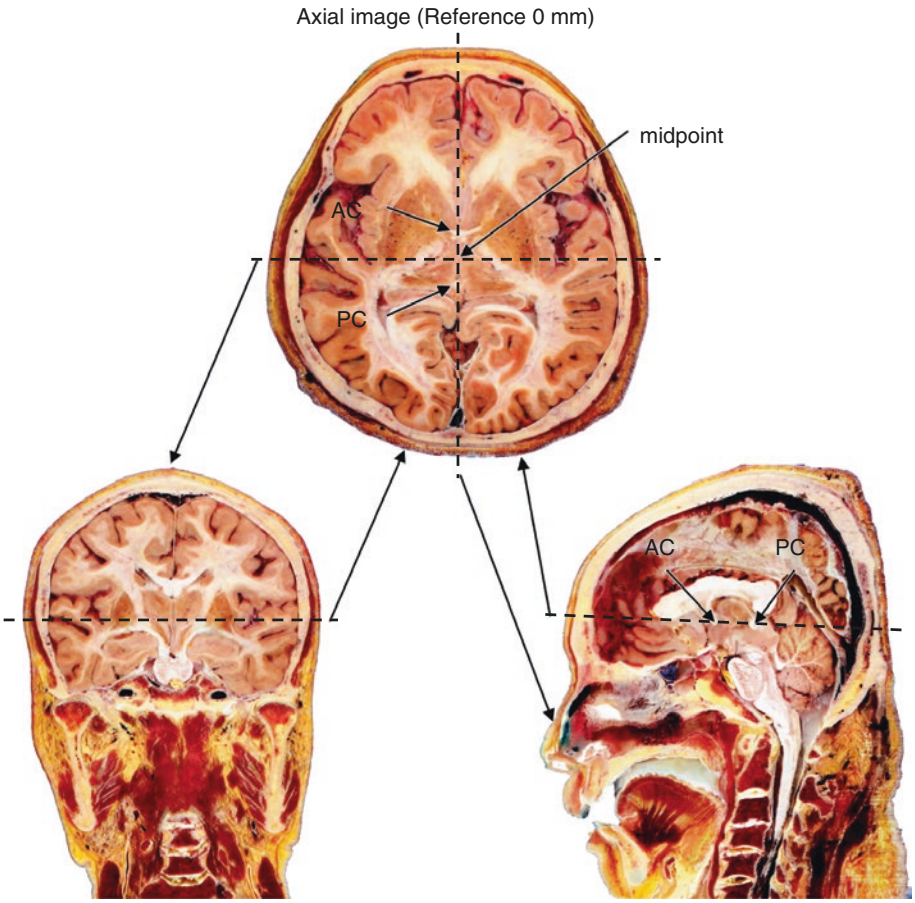
1.1 Making Cross-Sectional Images

Cross-sectional images of the human body have high resolution with real color unlike CTs and MRIs. Therefore, we prepared 2,343 cross-sectional images (axial direction, 0.1 mm intervals, 0.1 × 0.1 mm^2 pixel size, and 48-bit color) by serial-sectioning the cadaver head of Visible Korean. After the cross-sectional images of axial plane were reconstructed by volume modeling, coronal and sagittal sectional images were prepared (Park et al. 2009).



1.2 Reference System

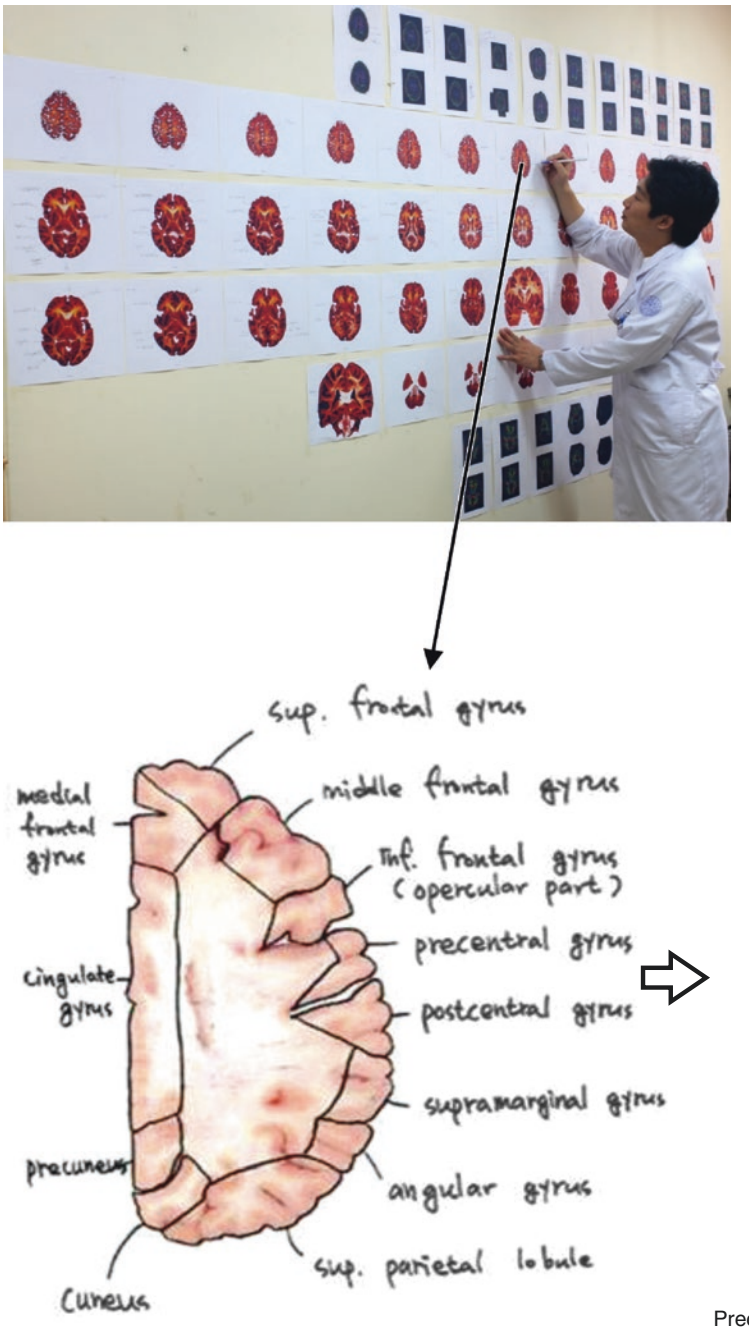
The reference system of these cross-sectional images is composed of one principal point and two ancillary points. The two ancillary points are anterior commissure (AC) and posterior commissure (PC). And the principal reference point is the midpoint of two ancillary points. It resides in the center of whole brain (Park et al. 2010).



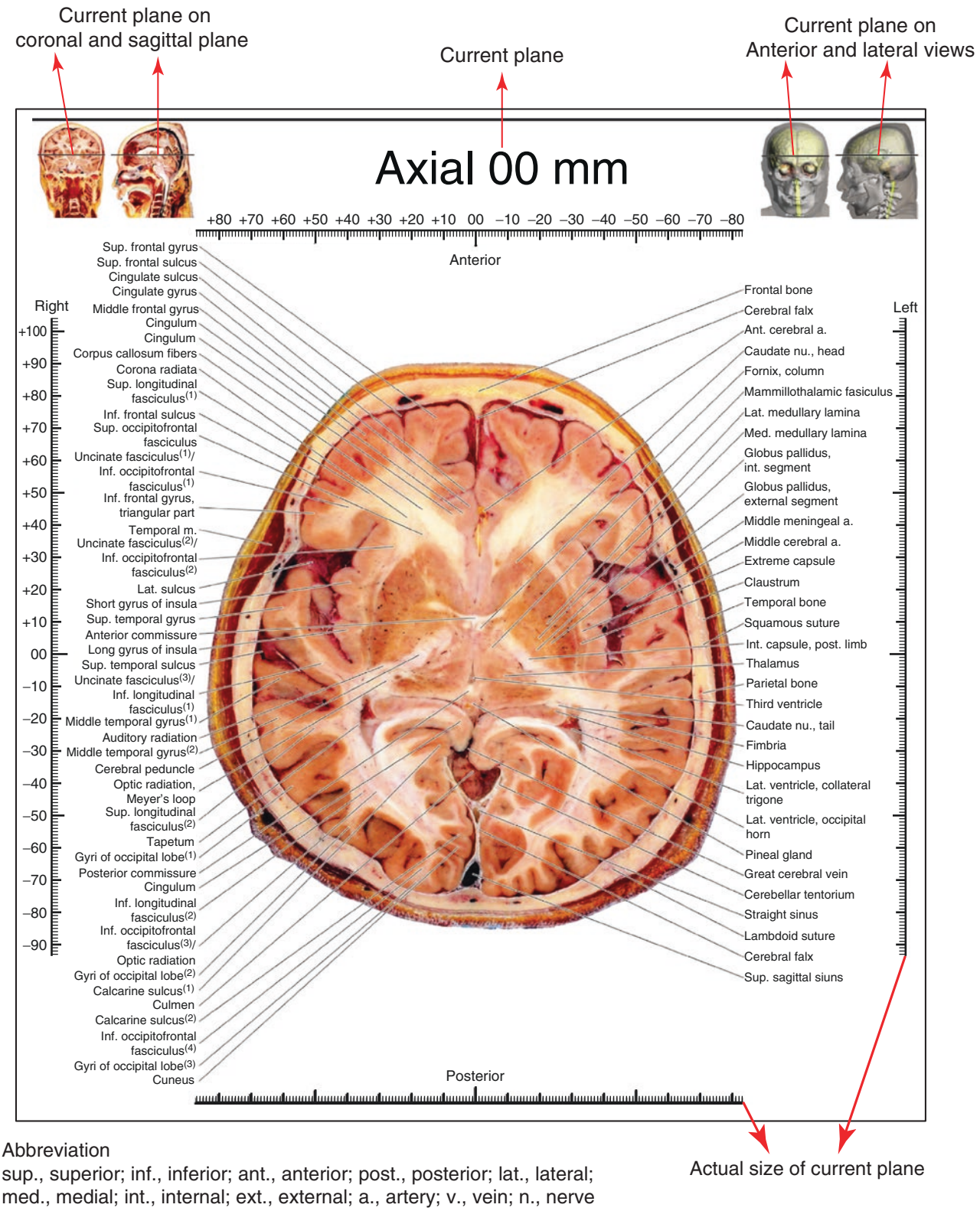
1.3 Terminology and Labelling

Accurate anatomical terms are essential to the anatomy atlas. Therefore, all anatomical terms in this atlas were labelled based on the authorized terms, Terminologia Anatomica (Termi FCoA 2002).

It was difficult to identify directly each structure on the cross-sectional images. Therefore, I worked as follows. The images were printed onto papers. The structures were traced by referring to other atlases and anatomy books (Cho 2014, 2015; Schuenke et al. 2010). Every identified structure was denoted on the paper. Based on the papers, the identified structures were labelled on PowerPoint 2016 (Microsoft Corp., Seattle, WA, USA).



1.4 Quick Guide to Use of This Atlas



Abbreviation
sup., superior; inf., inferior; ant., anterior; post., posterior; lat., lateral; med., medial; int., internal; ext., external; a., artery; v., vein; n., nerve

Acknowledgements This research was financially supported by the Ministry of Trade, Industry and Energy (MOTIE) and Korea Institute for Advancement of Technology (KIAT) through the International Cooperative R&D program (Grant number: N0002249). Raw data of the Visible Korean were acquired by financial assistance from Korea Institute of Science and Technology Information.

References

Cho ZH. 7.0 Tesla MRI brain atlas, in vivo atlas with cryomacrotome correlation. 2nd ed. New York: Springer; 2014.

Cho ZH. 7.0 Tesla MRI brain white matter atlas. 2nd ed. New York: Springer; 2015.

Park JS, Chung MS, Shin DS, Har DH, Cho ZH, Kim YB, Han JY, Chi JG. Sectioned images of the cadaver head including the brain and correspondences with ultrahigh field 7.0 T MRIs. Proc IEEE. 2009;97:1988–96.

Park JS, Chung MS, Park HS, Shin DS, Har DH, Cho ZH, Kim YB, Han JY, Chi JG. A proposal of new reference system for the standard axial, sagittal, coronal planes of brain based on the serially-sectioned images. J Korean Med Sci. 2010;25:135–41.

Schuenke M, Schulte E, Schumacher U. Atlas of anatomy, head and neuroanatomy. Leipzig: Thieme; 2010.

Termi FCoA. Terminologia anatomica. Leipzig: Thieme; 2002.

Part I

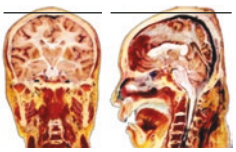
Whole Head

Whole Head: Axial

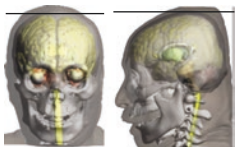
2

+72 mm ~ +24 mm, 4 mm intervals
+24 mm ~ −56 mm, 2 mm intervals
−56 mm ~ −140 mm, 4 mm intervals
All images, 0.1 mm × 0.1 mm sized-pixel

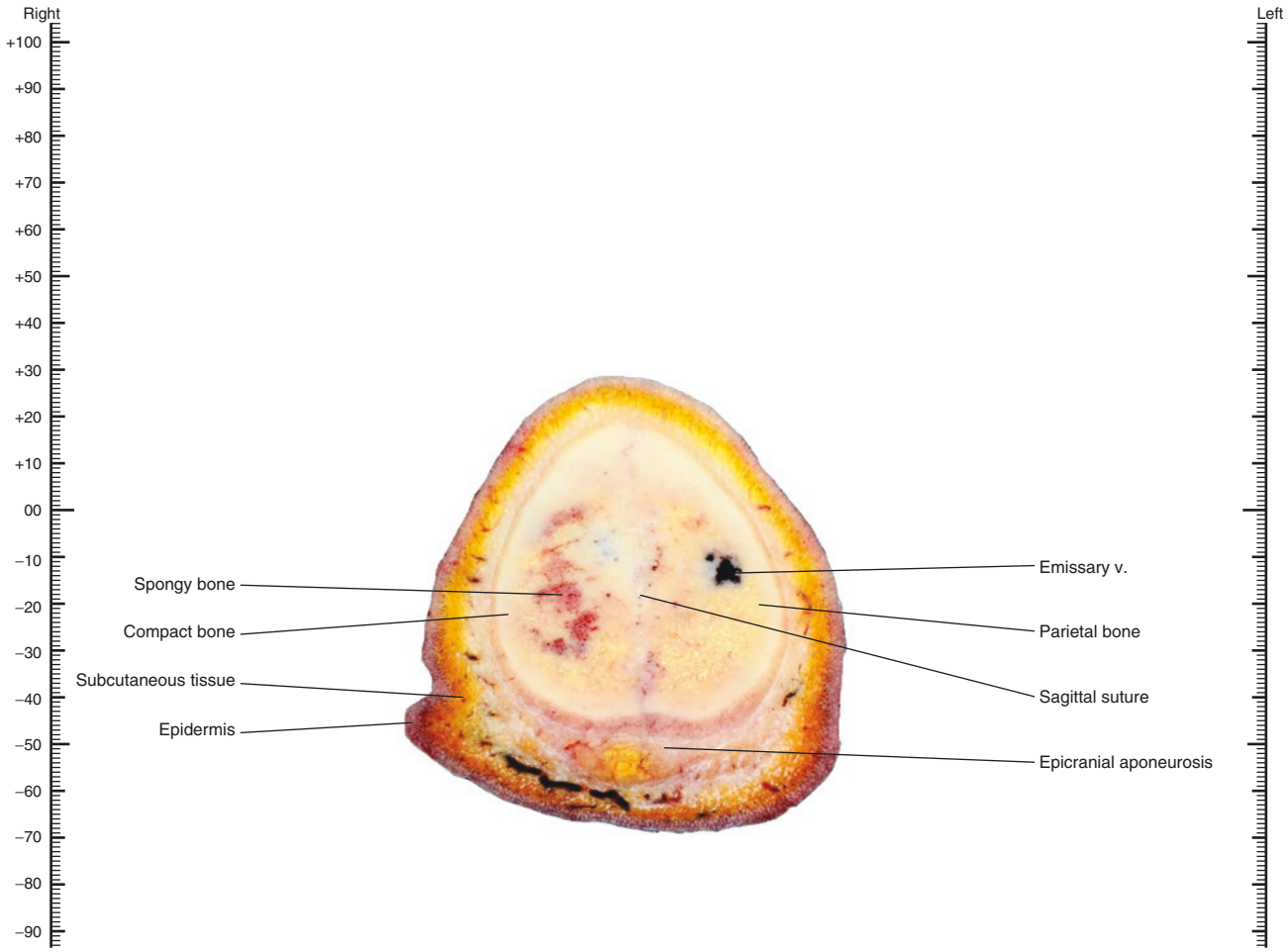
J.S. Park, *Cross-Sectional Atlas of the Human Head*, https://doi.org/10.1007/978-981-10-0770-5_2

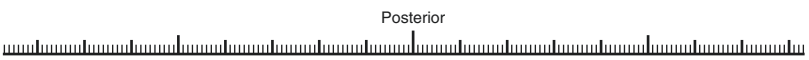


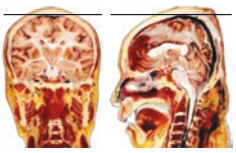
Axial + 72 mm



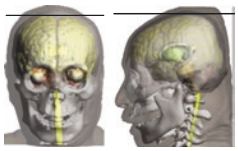

+80 +70 +60 +50 +40 +30 +20 +10 00 −10 −20 −30 −40 −50 −60 −70 −80
Anterior


Right
Left
+100
+90
+80
+70
+60
+50
+40
+30
+20
+10
00
−10
−20
−30
−40
−50
−60
−70
−80
−90
Spongy bone
Compact bone
Subcutaneous tissue
Epidermis
Emissary v.
Parietal bone
Sagittal suture
Epicranial aponeurosis

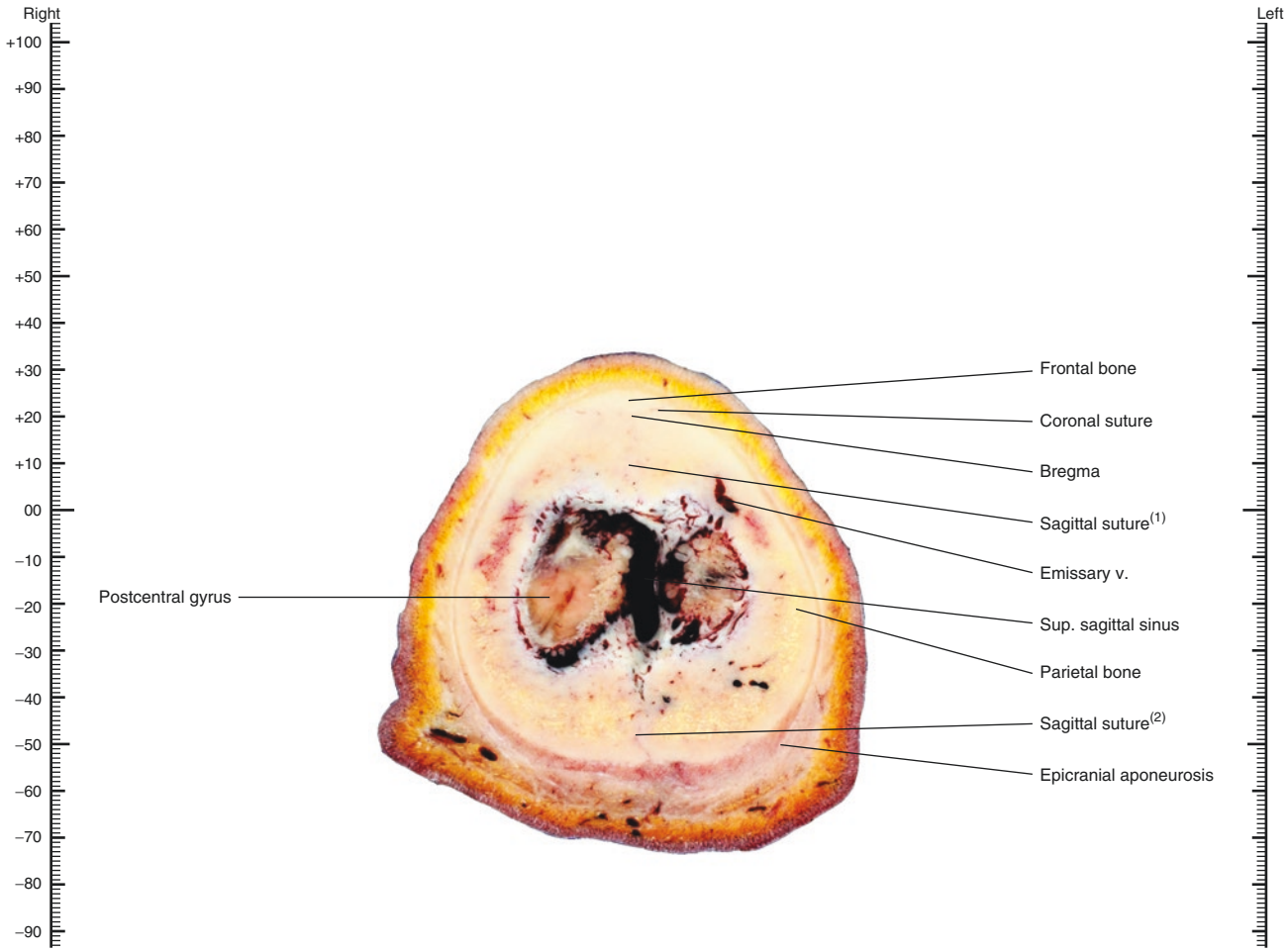

Posterior

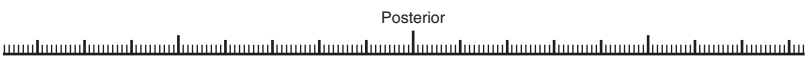


Axial + 68 mm




+80 +70 +60 +50 +40 +30 +20 +10 00 −10 −20 −30 −40 −50 −60 −70 −80
Anterior


Right
Left
+100 +90 +80 +70 +60 +50 +40 +30 +20 +10 00 −10 −20 −30 −40 −50 −60 −70 −80 −90
Frontal bone
Coronal suture
Bregma
Sagittal suture(1)
Emissary v.
Sup. sagittal sinus
Parietal bone
Sagittal suture(2)
Epicranial aponeurosis
Postcentral gyrus


Posterior