

Chapter 5

Anatomy of the Sutures of the Skull Base



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5.1 Introduction

The human cranium is comprised of calvarial, facial, and basal sutures, the majority of which are paired [1]. Sutures are made up of fibrous connective tissues that allow for flexibility and expansion of the skull, while preventing premature separation of bone [2]. Cranial sutures fuse once certain developmental milestones have been reached, which allows for natural childbirth and the expansion of the skull into the second and third decades of life [2]. In this chapter, we discuss the anatomy of the sutures of the cranial base, their clinical implications, and pathological variations.

5.2 Sutures of the Cranial Base

5.2.1 Occipitomastoid Suture

The occipitomastoid suture (Figs. 5.1 and 5.2), also known as the occipitotemporal suture, is a point of articulation between the squamous occipital bone and the mastoid portion of the temporal bone. This suture is continuous with the lambdoid suture and extends to the base of the skull [3, 4]. It typically fuses by age 16 years [3].

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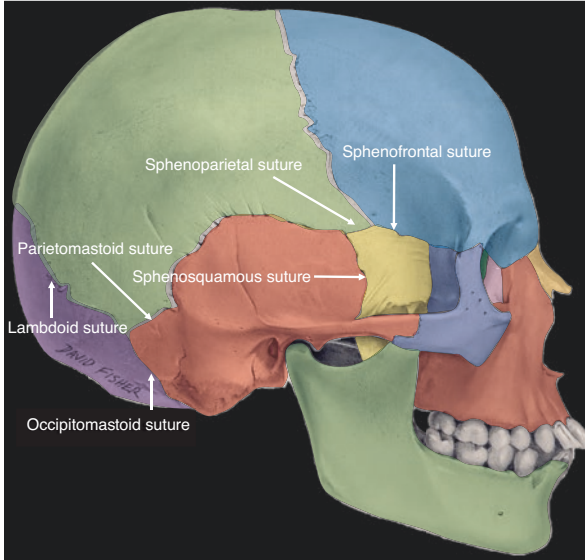
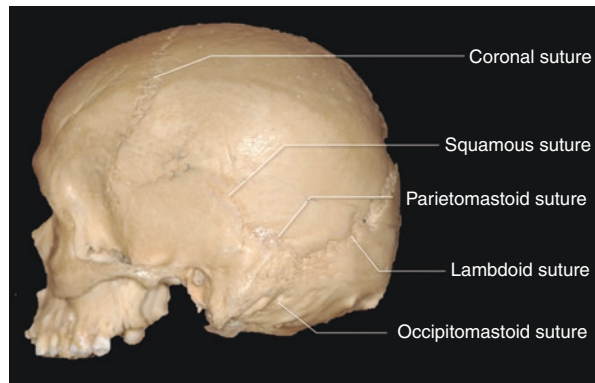


Fig. 5.1 Lateral image of the skull with many of the sutures of the skull base indicated. The frontal bone is colored blue, the parietal bone green, the occipital bone purple, the temporal bone red and the sphenoid bone yellow

Fig. 5.2 Lateral skull specimen with many of the sutures of the skull base indicated



5.2.2 *Parietomastoid Suture*

The parietomastoid suture (Figs. 5.1 and 5.2) connects the temporosquamous and lambdoid sutures on either side of the cranium. The parietomastoid suture is short, nearly horizontal, and divides the mastoid process of the temporal bone from the mastoid angle of the parietal bone [3].

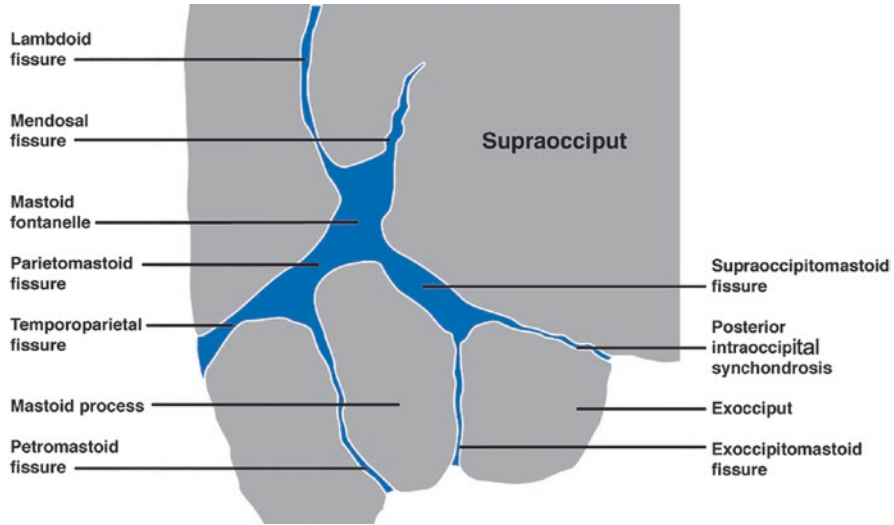


Fig. 5.3 Schematic drawing of the development of the sutures surrounding the left mastoid fontanelle (asterion)

5.2.3 *Mendosal Suture*

The mendosal suture (Fig. 5.3), or accessory occipital suture, originates above the asterion, a landmark found at the posterior end of the parietomastoid suture, and runs horizontally from the medial part of the lambdoid suture [5]. It is typically situated superior to the transverse sinus [5]. Closure of the mendosal suture is still debated but typically occurs between infancy and 10 years of age although it can persist into adulthood.

5.2.4 *Sphenofrontal Suture*

The sphenofrontal suture (Fig. 5.4) is a continuation of the coronal suture [4]. It is a transverse structure between the anterior margin of the lesser wing of the sphenoid and the posterior margin of the horizontal orbital plates [3]. The suture can be further divided into medial and lateral aspects. The medial segment is part of the anterior cranial fossa and connects the lesser wing of the sphenoid bone with the frontal bone. This segment is relatively straight and horizontal. The lateral segment is part of the middle cranial fossa. It has a more complex shape as it connects the greater sphenoid wings to the frontal bone. Embryologically, the medial and lateral segments represent two different sphenofrontal sutures. The medial segment connects one bone of endochondral ossification with a bone of membranous ossification [6]. The lateral segment is a purely membranous articulation [6].

Fig. 5.4 Left lateral skull specimen with sutures near the pterion

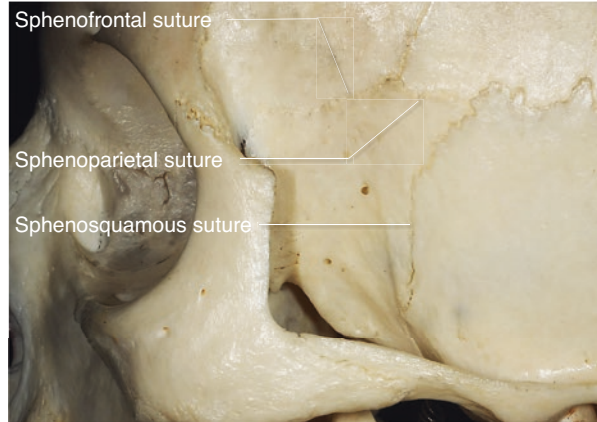
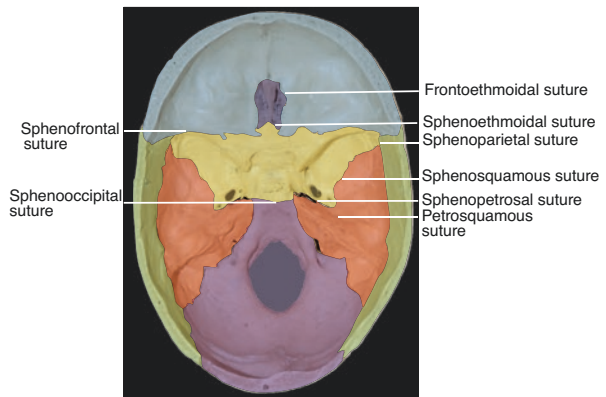


Fig. 5.5 Sutures of the skull base from an internal view



5.2.5 *Sphenosquamous Suture*

The sphenosquamous suture (Figs. 5.4 and 5.5), or squamomastoid suture, separates the sphenoid and squamous temporal bones. This suture runs vertically and inferior to the pterion. It is often mistaken for a cranial base fracture due to its anatomical location [3].

5.2.6 *Sphenoethmoidal Suture*

The sphenoethmoidal suture (Fig. 5.5) connects the medial margin of the lesser wing (orbital surface) of the sphenoid bone and posterior margin of the orbital plate of the ethmoidal labyrinth of the ethmoid bone. This suture forms in early childhood [7].

5.2.7 Sphenoparietal Suture

The sphenoparietal suture (Figs. 5.4 and 5.5) is a small articulation between the sphenoid and parietal bones. It is one of the sutures that comprises the pterion.

5.2.8 Petrosquamous Suture

The petrosquamous suture (Fig. 5.5) can be found in the middle cranial fossa. This suture is an articulation between the petrosal and squamous parts of the temporal bone. It overlies the eustachian tube and forms Koerner's septum, also known as the internal petrosquamous lamina [8]. The superior tympanic artery, a branch of the middle meningeal artery, passes through the petrosquamous suture [8]. This suture may also contain the petrosquamous sinus and is important to note during otolaryngologic surgery [9].

5.2.9 Sphenopetrosal Suture

The sphenopetrosal suture (Fig. 5.5), or sphenopetrosal fissure, is located in the middle cranial fossa. It is an articulation between the greater sphenoidal wing and the petrous portion of the temporal bone. It originates at the level of the mandibular fossa and runs anteromedially along the petrous temporal bone [10]. The suture forms the posterior portion of foramen lacerum, which is posterior to foramen ovale and anterior to the carotid canal [10].

5.2.10 Sphenooccipital Suture

The sphenooccipital suture (Figs. 5.5, 5.6, and 5.7) refers to the junction between the basiocciput and basisphenoid, which together form the clivus. Current data suggest that sphenooccipital synchondrosis is heavily influenced by pubertal hormonal changes, with girls reaching closure 1–3 years earlier than boys [7]. As a result, degree of closure can be used to reliably predict age in teenagers and young adults [11–14].

5.2.11 Frontoethmoid Suture

The junction between the ethmoid bone and frontal bone is the frontoethmoid suture (Fig. 5.5). In the anterior cranial fossa, this junction is centrally located.

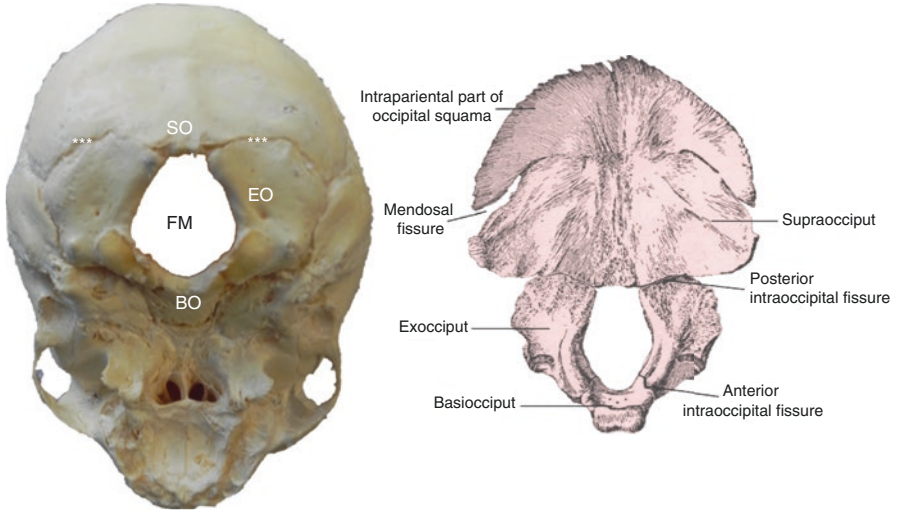


Fig. 5.6 Inferior view of a fetal skull noting the supraocciput (SO), exocciput (EO), basiocciput (BO), foramen magnum (FM), and posterior intraoccipital fissure (asterisks)

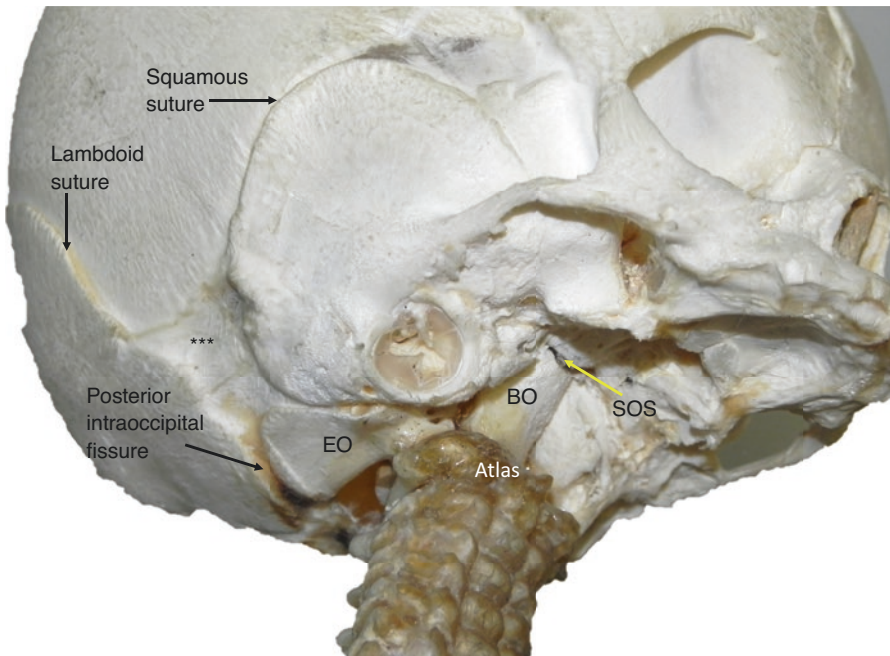


Fig. 5.7 Right lateral view of the skull with various sutures indicated. The asterion (asterisks), exocciput (EO), basiocciput (BO), and sphenoccipital synchondrosis (SOS) are seen

5.3 Clinical Relevance

5.3.1 *Craniosynostosis*

Craniosynostosis is the premature fusion of one (simple) or multiple (compound) sutures [2]. While coronal and lambdoid synostosis are most common, skull base sutures are also often involved. For example, sphenofrontal synostosis occurs and may be confused with coronal synostosis [2, 4]. Physical signs of sphenofrontal involvement include a downward deviation of the supraorbital margin and tip of the nose toward the affected side [4]. Complications include increased intracranial pressure, facial asymmetry, and malocclusion [2]. While craniosynostosis may be influenced by a variety of factors, FGFR gene coding is thought to be responsible for a majority of cases [1].

5.3.2 *Basal Cranial Fractures*

Basal sutures can often resemble cranial fracture lines as can basal fissures, foramina, and neurovascular channels [9, 15]. Knowledge of suture anatomy allows individuals to rule out skull fractures. Additionally, basal fractures can result in widened, diastatic sutures [15]. A diastatic suture should raise suspicion for fractures elsewhere.

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