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# The Choroidal Fissure: *in medias res*

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# **The Choroidal Fissure: *in medias res***

*Midway upon the journey of our life*
*I found myself within a forest dark,*
*For the straightforward pathway had been lost.*

- opening of *Inferno* from *The Divine Comedy* by Dante Alighieri[1]

Dante's *Inferno* is perhaps one of the most famous examples of the use of *in medias res* in literature. This powerful literary and cinematic technique is used to land the observer in the middle of the story, somewhat lost, without the slow progression of narrative for comfort. 'In the midst of things' is perhaps a feeling best avoided in the operating theatre; yet, the same feeling elsewhere in the neurosurgical '*journey of our life*' can otherwise be compelling. Neuroanatomy is after all a story in its own right and, for those minded to fully understand the origins of the human brain in health and disease, this quickly becomes apparent. Nonetheless, the straightforward path can be easily lost.

The choroidal fissure is notable in both its simplicity and complexity. Owing to its three-dimensional relationships deep within the brain, perhaps alien to the more regular familiarity of the cerebral cortex, it is a hard concept to understand for many trainees. Yet, it is no less important to have a comprehensive understanding of its central position in many subjects pertinent to neurosurgical care and disease. Arguably, the choroidal fissure is truly in the midst of all things, but how best to approach the topic of the choroidal fissure to an end that is hoped can build upon the already great work that has come before, whilst conferring tangible insights to trainees and students alike? In other words, why do we need to know about it?

Naturally, it is necessary to look to the pioneers of microsurgical anatomy and technique, M. Gazi Yasargil and Albert L. Rhoton Jr, and the wealth of knowledge that comes with reading their work and that of many others. Additionally, however, we can consider a myriad of questions in unison that bring the choroidal fissure to the fore: what are the origins of its three-dimensional relationships? Why is there a differential vascular supply to otherwise intimately related anatomical structures? What is the role of the choroidal fissure in the onset and spread of common neurosurgical disease? And how can we utilise this natural gateway in neurosurgical intervention? By addressing such concepts together, it is hoped that the importance of the choroidal fissure will become increasingly evident.

*The human brain has a complex anatomy, and to favor its understanding, to organize its nomenclature, and for clinical practice, it has been arbitrarily divided into lobes, regions, and compartments.*

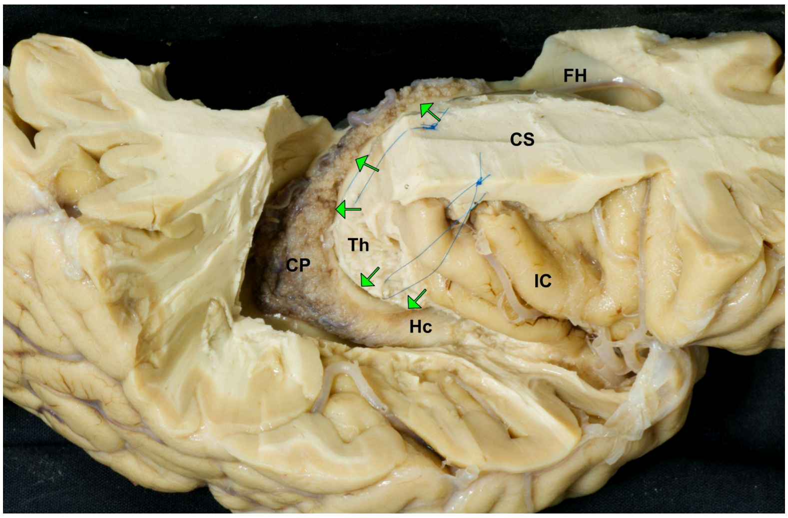
- Eduardo Carvahal Ribas *et al*[2]

It has been said that the way we view and understand the anatomy of the brain is largely a consequence of convenience with respect to its superficial appearance and our nascent understanding of the relationship between structure and function[2]. In many respects, we are now approaching a more comprehensive knowledge that will undoubtedly take us away from the cortico-centric views of the recent past. For instance, the concept of the human 'connectome' has received significant attention in recent years with the development of greater proficiency in both anatomical and radiological techniques for establishing detailed white matter anatomy[3, 4, 5], bringing us closer to truly understanding the microanatomical substrate of the brain. But within the shifts of time there exist some constants, islands of anatomy that are as revealing as they are beautiful. For an example of this, consider the central core which has been well described by a number of eminent authors[2, 6, 7] and which represents a 'natural and obvious anatomical delimitation'[2]. This is in sharp contrast to our evolving perception of the organisation of the cerebral cortex and its underlying white matter connections. In this same vein, the choroidal fissure is a natural cleft, an anatomical constant. It represents the thinnest site in the boundaries of the lateral ventricle[8] and is intimately related to the central core of the brain. It is first and foremost on this basis that the choroidal fissure as a concept can be framed, but there exist numerous other important perspectives that warrant our attention.

To expand on this point briefly, it is well known that the human brain is the most recent chapter in a very long lineage. Whilst the original extrapolations of Maclean's *Triune Brain* theory[9] were perhaps misconceived[10, 11], the notion of evolutionary layering in the brain is familiar to most. Take the cerebellum for example and its three constituent parts or lobes: the archae-, paleo- and neocerebellum, corresponding largely to the flocculonodular lobe, vermis and paramedian hemispheres, and lateral cerebellar hemispheres respectively. The terminology used here gives a sense of tangible evolution of the cerebellum's component parts towards a life of bipedalism and fine motor proficiency, which is further enforced by considering at the same time their respective functions and alternative terminology: balance and conjugation of eye movements (vestibulocerebellum), truncal posture and equilibrium (spinocerebellum); and complex motor planning (cerebrocerebellum). Depending on which view appeals most to the learner and their needs, it is possible to approach the same anatomical subject from a different perspective, whichever achieves the greater effect: anatomical, evolutionary, functional, and finally, pathological, i.e., why do our patients display cerebellar signs on examination with posterior fossa pathology? Tackling one aspect or other leads to valuable insights into the remainder and can be extremely rewarding. So, returning now to the choroidal fissure, what we do not yet have is a composition of work on this integral neuroanatomical structure that takes into consideration each of these essential perspectives and finally presents to us, as learners, the whole.

**Left choroidal fissure exposed:** follow this link to see this brain specimen in 3D.

In the simplest sense, the choroidal fissure is a thin cleft that is situated between the fornix and the thalamus. This exists as one of a number of identifiable curves or C-shapes, the significance of which later becomes apparent. If one can identify the junction between these two structures, the choroidal fissure is in hand. Its position is perhaps most easily imagined in conjunction with the transfrontal endoscopic view of the lateral ventricle, certainly in regards to its most superior extent. The choroidal fissure extends from the posterior aspect of the interventricular foramen of Monro to the inferior choroidal point (of Théron) in the mesial temporal lobe. It is immediately obvious of course that the fornix, the chief efferent fasciculus of the hippocampus, exists in exactly the same configuration. When visualising the landmarks of the lateral ventricle from this perspective the choroidal fissure is covered by the choroid plexus throughout its course as a parallel C-shape of its own, attached to the fissure at its depth. It is therefore present through the body, atrium and the majority of the temporal horn of the lateral ventricle, prevented from reaching the more distal frontal horn by the foramen of Monro, and the anterior limits of the temporal horn by the head of the hippocampus (**Figure 1**). As a result, the choroidal fissure should be considered very much a feature of the lateral ventricle despite being a conduit to the third ventricle, pineal region and perimesencephalic cisterns medially[8].

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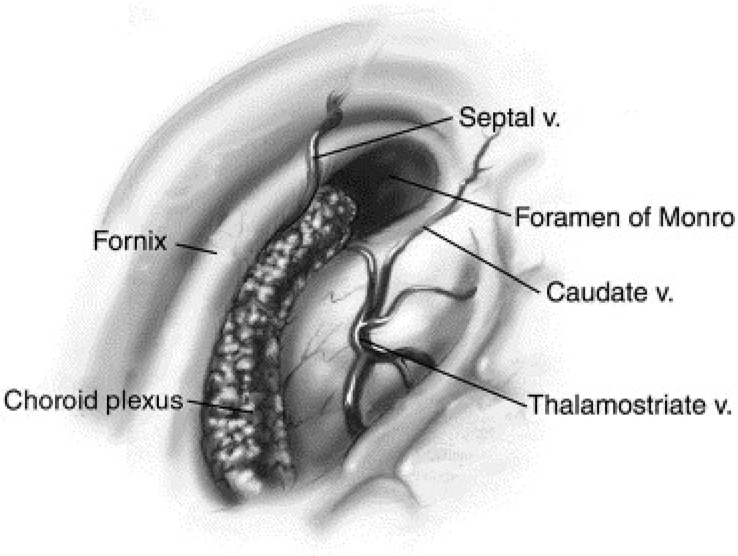


B

**Figure 1: A**: Lateral view of the choroidal fissure of a right hemisphere. The frontal, parietal and temporal operculae have been removed, exposing the trigone and temporal horn of the lateral ventricle, as well as partially the body and frontal horn. The insula is the lateral extreme of the central core. Green arrows depict the choroidal fissure. The choroid plexus overlies the fornix.

**B**: Endoscopic view of the foramen of Monro with key intra-operative landmarks labelled. Taken from Farin et al. Endoscopic Third Ventriculostomy. Journal of Clinical Neuroscience Volume 13, Issue 7, August 2006, Pages 763-770

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In delineating the central core, the choroidal fissure is integral [2, 7, 12] and thus it contributes to the demarcation of phylogenetically distinguishable brain regions[12]. The central core extends from its lateral extreme on the surface of the insula lobe (of Reil), to its inner boundary with the lateral ventricle. Therefore, it encompasses notable structures that include the basal ganglia, claustrum, the internal, external and extreme capsules, and the thalamus[2]. It is in continuity through white matter projections superiorly to adjacent cerebral cortices and inferiorly to the mesencephalon and brainstem. Ribas et al[2] were able to completely define the central core by extending a trajectory through three planes that each incorporated respective limiting sulci of the circular sulcus of the insula, i.e., each of the superior, inferior, and posterior limiting sulci. Besides the anterior limiting sulcus, the remainder integrate with the choroidal fissure at their depths, allowing seamless separation of the central core from the relatively more 'recent' limbic structures (parahippocampal gyrus, hippocampus, fornix and amygdala), as well as the neocortex through division of the adjoining white matter. In Maclean's parlance, the emotional paleomammalian (limbic) brain is detached from the deeper, irrational reptilian brain (central core)[9, 13]. Whilst the most appropriate ancestral nomenclature is certainly reason for debate, the physical connotations are undeniable and underline the overall theme of evolution and topological shifts over time[13].

Naturally, we can observe these anatomical relationships and the choroidal fissure's formation in the course of human embryology, and what is striking is the early predominance of the fissure and its associated structures in the human embryo. Whilst embryology is accepted to be an inherently difficult and esoteric subject, it is hugely insightful when discussing the topic in hand. The concept of the neural tube and its closure can at least be taken for granted in the first instance, occurring by week four of gestation, and prior to this moment the open neural tube has been sustained by simple mechanisms of diffusion from the amniotic fluid. Its closure, however, demands the onset of a defined cerebrovascular system[14]. At this time, the neural tube is enveloped by the primitive meninges or *meninx primitiva*. Contained within are the primordial vascular loops that will give rise to the cerebrovascular system as we understand it to be. But this requires a process of invagination, in order to bring the outside in, and the choroidal fissure is in part fundamental to this process[14, 15]. This demand on the early vasculature is further driven by the manifestation of the three primary brain vesicles; the rhombencephalon, mesencephalon and prosencephalon, and was first elucidated in detail by Padget[16] through her seminal work into seven key embryonic stages. With regards to understanding the choroidal fissure, however, we need really only consider the fifth stage, later dubbed the 'choroid stage' (of Klosovskii)[17].

The choroid stage begins around forty days of gestation with formation of the choroid plexus of the emerging lateral ventricles. By now, the telencephalic vesicle and distinct diencephalon are recognisable as having diverged from the earlier prosencephalon. A single primitive lateral ventricle exists within each telencephalic vesicle as the site of the developing choroid plexus, the ventricles themselves existing as evaginations from the medial origins of the foramina of Monro. The future vascular supply to the choroid plexus can be traced to early iterations of the anterior cerebral artery anteriorly, the anterior choroidal artery inferiorly, and the posterior choroidal artery posteriorly. An embryonic mesencephalic artery provides additional transmesencephalic feeders. Interestingly, it is this very collection of four arteries that give rise to vein of Galen malformations in our neonatal and paediatric populations[17, 18] when they become too intimately related with the prosencephalic vein (of Markovski)[18]. Clearly, there is great stock placed on the choroidal arteries at this very early embryonic phase that belies their relative obscurity in the adult circulation and the predominating Circle of Willis.

The choroidal fissure is therefore the means to an end. The invagination of essential arteries to the growing choroid plexus, itself essential to the growth and sustainability of the human embryo. This invagination occurs from weeks seven to eight, investing vascular pia mater from the *meninx primitiva* along with mesodermal precursors of primarily vascular and connective tissues, later comprising the fully formed tela choroidea[15]. In the absence of neuroectodermal precursors, no nervous tissue exists in the choroidal fissure, rendering it discrete and easily divisible through to adulthood. Yet, the anterior and posterior choroidal arteries are entrapped within it and remain so, forming important surgical considerations in transchoroidal and subchoroidal approaches[8, 19, 20, 21], as well as potentially explaining the intriguing conundrum as to why the hippocampus and its contiguous fasciculus, the fornix, have such distinctly separate vascularity.

The tela choroidea itself can be considered the juxtaposition of pia mater and ventricular ependyma[22]. Recalling that the choroidal fissure has a C-shaped orientation, it is akin to the aforementioned fornix, as well as other integral components of the limbic system: the stria terminalis (amygdaloid outflow), cingulate and parahippocampal gyri (limbic lobe) and cingulum bundle. This is truly a 'border' zone as the latin *limbus* implies, and the product of those topological changes that result in the descent and rotation of these principal nuclei and tracts from their more dorsal embryonic beginnings[2, 7, 12, 13]. The tela choroidea is therefore seen in close association with a number of these structures and with important attachments throughout. Thickenings of the ventricular walls known as 'taenia' confer a scaffold on which the tela choroidea is attached, in turn giving root to the choroid plexus itself. These occur on the medial and lateral margins of the choroidal fissure throughout and are named accordingly: *taenia thalami* and *taenia fornicis* in the body and atrium of the lateral ventricle; and *taenia stria terminalis* and *taenia fimbria* in the temporal horn, as far as the inferior choroidal point[22]. With the fimbria and fornix projecting from the hippocampus lateral to the central core, the *taenia fimbria* will constitute the lateral margin of the choroidal fissure in the temporal horn until the forniceal crus medialises behind the pulvinar of the thalamus and continues on to form the midline body of the fornix in the roof of the third ventricle. From this point, the thalamus constitutes the inferolateral bounds of the choroidal fissure in the body and atrium of the lateral ventricle, with the tela choroidea attached via the *taenia thalami* laterally and the *taenia fornicis* medially, establishing an oblique trajectory to the velum interpositum beneath. The choroid plexus is simply the intraventricular expansion of the vascular pia mater by this means, occurring towards the lateral ventricle from the medial surface[22], hence the choroid plexus overlies the choroidal fissure when viewing the lateral ventricle from a dorsolateral point of view.

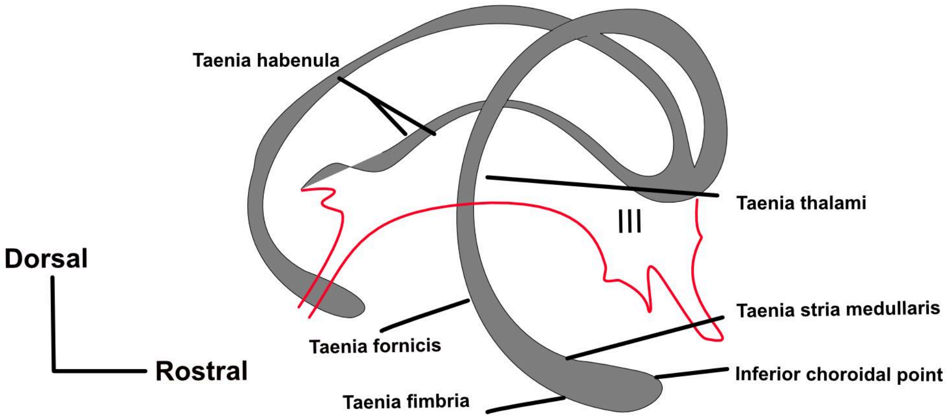


**Figure 2:** Illustration of the tela choroidea and its attachments. Adapted from Destrieux *et al*: *Surgical anatomy of the hippocampus*[22].

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*But after I had reached a mountain's foot,*
*At that point where the valley terminated,*
*Which had with consternation pierced my heart,*

*Upward I looked, and I beheld its shoulders,*
*Vested already with that planet's rays*
*Which leadeth others right by every road.*

\- *Inferno*, by Dante Alighieri

For now, the choroidal fissure has been presented with regards to its origins and superficial anatomical characteristics. Contrast the 'forest dark' with where we are now at the 'mountain's foot', it is hoped that the climb is that much easier, with the termination of the valley being as good a place to begin as any.

The inferior choroidal point, or velum terminale[22], has been attributed to Jacques Théron[23], a neuroradiologist and interventionist. It represents an angiographically important point, commonly referred to as the 'plexal point', and is visible on lateral carotid injections where the anterior choroidal artery enters into the choroidal fissure and the choroid plexus[24]. This differentiates the anterior choroidal artery into cisternal and plexal segments[25] and is identified firstly by the artery's origin between the termination of the internal carotid artery and the origin of the posterior communicating artery, then by tracing its steep descent and sharp posterior turn as it enters the temporal horn where the plexal segment continues[26].

As has been said, the anterior choroidal artery is a prominent feature of the early human embryo and integral to the choroidal stage of development. This is the result again of conservation of vascular homologs in phylogenetically distinct species, where it can be seen vascularising what would constitute the territory of the posterior cerebral artery in humans[28]. As with much of the cerebrovascular system, it is subject to notable variations in the adult patient population. A network of anastomoses also exist between the anterior choroidal and posterior choroidal arteries as early as the third Padget Stage, or 33 days gestation, known as the 'limbic arterial arch', which precedes their termination in the choroidal fissure during the fifth stage[29]. The anterior choroidal artery then typically undergoes significant regression in favour of an increasing posterior choroidal artery supply of the choroid plexus, with the anterior choroidal artery instead preferentially directed to the pallidum and associated structures over time[16, 29]. This gives rise to an inversely proportional relationship at the choroid plexus which largely dictates the variations seen in the origins, frequency and course of the adult lateral posterior choroidal artery in response: the greater the extent of anterior choroidal artery supply to the plexus, the less the lateral posterior choroidal artery contributes and the more superiorly it is seen to enter the choroidal fissure, on occasion as high as in the body of the lateral ventricle [30, 31].

This anastomotic network has been shown to facilitate one of the number of shunt systems that exist in the adult cerebrovasculature beyond those seen at the Circle of Willis. It is well known that leptomeningeal anastomoses over time can facilitate shunting at the watershed areas of the cerebral cortex, and that external carotid-internal carotid artery system shunts exist in the orbit, namely through the ophthalmic artery, as well as at the cavernous-petrous region; whilst the occipital artery can give rise to anastomoses with the posterior cerebral artery territory and, therefore, the vertebrobasilar system[33]. Chronic vascular insufficiency can drive these networks to become clinically important, indeed essential. For instance, compensatory flow through the choroidal anastomoses has been demonstrated to alleviate symptoms of crescendo middle cerebral artery territory infarction[32]. Conversely, however, the same anastomoses are attributed to the occurrence of spontaneous intraventricular haemorrhage and recurrent haemorrhagic complications of Moyamoya disease[34, 35].

The inferior choroidal point is not only of vascular interest but is also an important surgical landmark, especially in cases of selective amygdalohippocampectomy via transcortical routes. This perhaps most commonly occurs via a trans-middle temporal gyrus approach whereby the inferior choroidal point can be estimated on the temporal lobe surface approximately 4.5cm from the temporal pole. Safe entry into the temporal horn can then be achieved, whilst lessening the risk to important white matter fasciculi, such as the optic radiations of Meyer's loop, and brings the surgeon into close proximity to the hippocampus and amygdala as intended[36]. An awareness of this key vascular point avoids disaster in an otherwise highly efficacious and life-changing intervention for patients with medically-refractory epilepsy of temporal lobe origin[36].

Nagata and Rhoton[8] defined the entire choroidal fissure into three component parts: a body portion, situated in the body of the lateral ventricle between the body of the fornix and the thalamus; an atrial part in the atrium of the lateral ventricle between the crus fornicis and pulvinar; and a temporal part in the temporal horn between the fimbria of the fornix and the inferior thalamic surface. Naturally, the temporal component is the location of the inferior choroidal point but it is also the commonest site of choroidal fissure cysts. Choroidal fissure cysts are themselves uncommon, but when present are typically incidental, benign lesions. By definition, they occur within the plane of the fissure but they can have neuroglial, neuroepithelial or arachnoid origins. Rarely, do they become symptomatic, though symptoms can arise in cases of progressively enlarging cysts that cause localised mass effect or hydrocephalus[15, 27]. Seizures can also occur with progressive temporal lobe compression[15].

Bilateral occurrences can be indicative of underlying genetic disorders, such as septo-optic dysplasia (Morsier Syndrome: optic nerve hypoplasia, midline brain and pituitary abnormalities), infantile spasms, diabetes insipidus and club feet[15]. Akin to the treatment of other intracranial cystic lesions, such cases can be managed by either endoscopic or open fenestration to allow communication with the basal cisterns, or alternatively by a cystoperitoneal shunt[15]. This anatomical relationship has also been shown to facilitate compensatory diversion of cerebrospinal fluid from the temporal horn of the lateral ventricle into the ambient cistern in cases of idiopathic normal pressure hydrocephalus, giving rise to the recognised radiological features of enlarged basal cisterns and Sylvian fissures in these patients[37].

Whether considering the fenestration of a choroidal fissure cyst into the basal cisterns or spontaneous cerebrospinal fluid diversion in normal pressure hydrocephalus, it helps to illustrate some of the medial anatomical associations of the choroidal fissure. If during an anatomical dissection you are intending to view the choroidal fissure from the hemisphere's medial surface, this firstly requires removal of the entire brainstem and especially the mesencephalon. By doing so, you are effectively entering the ipsilateral perimesencephalic cisterns comprising the crural, ambient and quadrigeminal cisterns respectively from anterior to posterior. Running through this region of especial importance are the posterior cerebral artery and its numerous perforating and cortical branches[30], as well as the basal vein (of Rosenthal) and trochlear nerve. The oculomotor nerve has an important association with the uncus of the medial temporal lobe rather than the fissure itself, and is exposed following extension of the inferior choroidal point as far as the uncal apex in procedures that involve disconnecting the hippocampal head. What this creates is an extensive exposure from the ambient cistern forward to the oculomotor and opticocarotid cisterns that are not otherwise seen by merely splitting the choroidal fissure itself[31]. On continuing our dissection, removal of much of the diencephalon then becomes necessary to visualise the entirety of the choroidal fissure from this medial perspective (**Figure 3**), giving rise to a privileged view of the medial temporal region, whereby the parahippocampal gyrus, subiculum, hippocampal sulcus, margo denticulatus, fimbriodentate sulcus and fimbria are all visible in series[22]. By extension, the fornix and choroidal fissure are now exposed, as well as the importance of the aforementioned choroidal arteries.

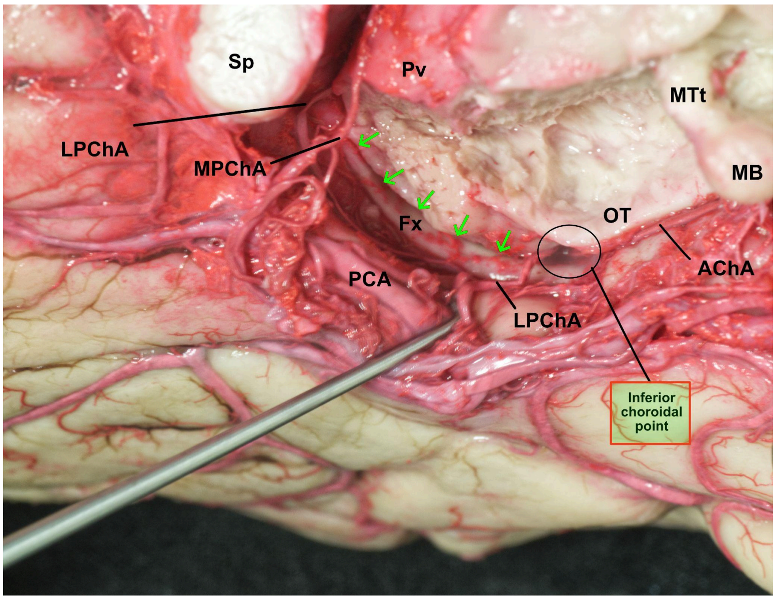


**Figure 3:** Medial view of the left hemisphere. Arterial system has been injected with red latex. The choroidal fissure is now visible following removal of the brainstem and mesencephalon, with partial dissection of the medial thalamus and pulvinar. The optic tract (OT) is the inferior margin of the diencephalic dissection and sits above the choroidal fissure. The choroidal fissure is highlighted by green arrows, sitting between the fornix (Fx) and the thalamus (Th). The inferior choroidal point is encircled and the lateral posterior choroidal artery can be seen entering posterior to the anterior choroidal artery (AchA). A second LPChA is seen to run in parallel to the fornix before crossing and entering the choroidal fissure superiorly.

**AChA**: anterior choroidal artery; **Fx**: fornix; **LPChA**: lateral posterior choroidal artery; **MB:** mammillary body; **MPChA**: medial posterior choroidal artery; **MTt:** mammillothalamic tract; **OT:** optic tract; **PCA**: posterior cerebral artery; **Pv**: pulvinar; **Sp**: splenium of the corpus callosum.

Not only do the choroidal arteries supply the choroid plexus of the lateral and third ventricles, they have significant contributions to adjacent neural structures that are becoming increasingly well described. Both the medial and lateral posterior choroidal arteries are exclusively branches of the posterior cerebral artery[31, 38]. The medial branch will most commonly arise from the proximal posterior cerebral artery and when doing so, it occurs at the anterior P2 (post-communicating) segment in around 75% of specimens, with the remaining 25% having an even more proximal origin from the P1 (pre-communicating) segment[38]. A 'distal' medial posterior choroidal artery is marginally less common, being seen in around 47% of specimens, in which cases it arises either at the distal P2 where the posterior cerebral artery divides into a number of temporal cortical branches, from the parieto-occiptial artery or even the calcarine artery in more unusual cases. Similar to its anterior namesake, it is considered to have a cisternal and plexal segment along its course regardless of its origin, and it ultimately enters the velum interpositum and roof of the third ventricle to supply the choroid plexus here. The majority will anastomose with the lateral posterior choroidal artery at the foramen of Monro. Along the way, important branches are given by the cisternal segment to the mesencephalon, cerebral crus, medial geniculate body and caudal pulvinar; whilst the plexal branches facilitate the blood supply to the superior pulvinar, superomedial thalamus and choroid plexus[38]. Infarction in the territory of the medial posterior choroidal artery, whilst rare, can be either asymptomatic or manifest as thalamic deficits that may be profound. Of great advantage, however, are the plexiform anastomoses that exist with its anterior and lateral posterior counterparts that serve to significantly compensate in such events; as well as multiple perforators of the posterior cerebral and superior cerebellar arteries that can safeguard the crus cerebri and tegmentum of the mesencephalon[38, 39].

The lateral posterior choroidal artery instead originates mainly from the posterior P2 (61%), less commonly the anterior P2 segment (26%), and rarely P3[31]. It is more likely to occur as a number of distinct branches and again its diameter, course and contribution to the choroid plexus is inversely correlated with the dominance of the anterior choroidal artery[31]. Three segments are described[31]: a cisternal segment within the ambient cistern, lateral to the cerebral crus from the vessel's origin on the posterior cerebral artery; a forniceal segment that begins at its entry into the choroidal fissure approximately 8mm posterior to that of the anterior choroidal artery, which then continues along the fimbriodentate sulcus giving off multiple plexal branches; and finally the pulvinar segment. Xu et al[31] further describe three patterns of lateral posterior choroidal arteries that take into account their level of entry into the choroidal fissure and the number of trunks present, whether single or multiple. Importantly, patterns that incorporate a single trunk are far more susceptible to iatrogenic infarction in the lateral posterior choroidal artery territory. The atrium of the lateral ventricle is a common site for intraventricular neoplasia[40, 41] and manipulation or coagulation of the choroid plexus can lead to downstream infarction and neurological sequelae attributable to the subependymal divisions and ventriculofugal arteries that supply the periventricular white matter[41].

A knowledge of the choroidal arteries is, therefore, of great importance in the surgical treatment of numerous intraventricular neoplasia. These are generally more common in the paediatric population, especially choroid plexus papillomas, with meningiomas and ependymomas forming the majority of truly intraventricular lesions in the adult population. Intraventricular extension of pseudoventricular lesions can also occur from the adjacent brain, especially in cases of gliomas. Meningiomas and choroid plexus metastases in particular will derive a significant vascular supply from the vessels of the choroid plexus and, as mentioned above, should be handled with care. In these cases, they are most often found at the glomus choroid plexus in the ventricular trigone, meaning the lateral posterior choroidal artery is the most pertinent consideration; whilst the medial posterior choroidal artery is implicated mostly in midline lesions including those of the septum pellucidum, such as neurocytomas[40]. The choroidal fissure not only accounts for the significant vascularity of such lesions, but it is also the means by which intraventricular tumours can span extra-axial compartments, especially enlarging meningiomas of either choroidal or tentorial origin[40].

*Microoperative techniques are utilized during approaches directed through the choroidal fissure in order to minimize retraction of the structures bordering the fissure and to optimize the use of the limited exposure.*

- Nagata and Rhoton[8]

Whilst the choroidal fissure behaving as a gateway for the extension of various neoplasia is pathological, its easy division is advantageous in allowing us deep surgical access for the treatment of the very same lesions: the so-called transchoroidal approach. A transchoroidal approach via the temporal choroidal fissure provides a generous exposure of tentorial hiatus meningiomas, as well as vascular lesions of the posterior cerebral artery, such as P2 aneurysms and medial temporal arteriovenous malformations[8, 24, 42], all the while minimising retraction of adjacent eloquent regions. Opening the fissure via the atrial portion into the quadrigeminal cistern is most frequently used to access vascular lesions located behind the pulvinar; whereas dividing the fissure in the body region will expose the velum interpositum and, by then dividing the tela choroidea, lesions of the third ventricle[8]. When dividing the choroidal fissure, it is accepted that this be performed on the forniceal or fimbrial margin given the abundance of arteries and draining veins that exist in the *taenia thalami*[8,19, 21, 42]. The branches of the medial and lateral posterior and anterior choroidal arteries enter the ventricle; and the thalamostriate, thalamocaudate, lateral atrial, and inferior ventricular veins exit the ventricle by passing through the *taenia thalami*[8]. During the approach, the choroid plexus is elevated and retracted towards the thalamus and the fornix gently retracted in the opposite direction to enable an adequate view. An alternative, subchoroidal approach to the third ventricle is also described[43] and is proposed to minimise the risk of forniceal injury, but this has nonetheless fallen out of favour due to the elevated risk of venous complications when entering the fissure on the thalamic side. Furthermore, the subchoroidal approach not infrequently involves sacrifice of the thalamostriate vein when utilised from the body of the lateral ventricle which, contrary to some previous reports, is generally associated with venous infarction of the basal ganglia[8,19, 21, 42].

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In December 1949, Sir Hugh Cairns delivered the Victor Horsley Memorial Lecture at University College Hospital, on the subject of '*Disorders of consciousness with lesions of the brain-stem and diencephalon*'[45]. His concluding remarks suggested that he had in fact presented '*nothing new about much that has been discussed in this lecture*'. The neuroanatomy of the choroidal fissure as presented here is really nothing new either, but neuroanatomy does allow us to revisit time and time again with new perspectives. This has been an attempt to bring the choroidal fissure to the attention of the neurosurgical trainee in a way that compliments their learning, highlighting its central position in the midst of our neurosurgical knowledge. I hope it has been well received.

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