Different Surgical Strategies in the Management of Parasagittal Meningiomas

Thesis

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Neurosurgery

By

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ABSTRACT

Parasagittal meningioma is a tumor that occupies the angle between the dura and the sinus, usually benign tumor but may be malignant. It has to be totally removed for complete cure but complete resection is sometimes difficult because of sinus invasion. Attempts for total removal in sinus invasion may lead to post-operative complications the most common is venous infarction which may be fatal. Attempts of sinus repair or reconstruction is also hazardous. Gamma knife radiosurgery is now the best option to handle a tumor residual within the sinus. The possibility of total removal is best withe anterior third tumors least with posterior third ones. Better results are obtained in tumors just attached to the wall of the sinus and decreases with sinus invasion.

Key Words: *superior sagittal sinus, gamma knife , sinus repair .*

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List of Abbreviations

DCL	:	Disturbed conscious level
LL	:	Lower limb
MRV	:	Magnetic resonant venography
SSS	:	Superior sagittal sinus
UL	:	Upper limb
V-P shunt	:	Ventricloperitoneal shunt

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CHAPTER I

Anatomy

The brain in the skull and the spinal cord in the vertebral column are covered by three protective membranes or meninges: the dura mater, the arachnoid mater and the pia mater. **(Mario and Antonio, 1998)**

The dura mater of the brain:

The dura mater of the brain is conventionally described as two layers:the endosteal layer and the meningeal layer, they are closely united except along certain lines where they separate to form venous sinuses. **(Valvassori et al, 1986)**

The endosteal layer is nothing more than the periosteum covering the inner layer of the skull bones, at the level of the foramen magnum it does not become continuous with the dura mater of the spinal cord.around the margins of all the foramina of the skull it becomes continuous with the periostium on the outside surface of the skullbones. At the suture lines it is continuous with sutural ligaments. It is most strongly adherent to the bones over the skull base. **(Lang, 1993)**

The meningeal layer is the dura mater proper. It is a strong dense fibrous membrane covering the brain and is continuous through the foramen magnum with the dura of the spinal cord. It provides tubular sheaths for the cranial nerves as they pass through the foramina of the skull, outside the skull the sheath fuses with epineurium of the nerves. **(Yasargil et al, 1996)**

The meningeal layer sends four in-wards septa which devides the cranial cavity into freely communicating spaces that lodge the subdivisions of the brain. The function of these septa is to restrict the displacement of the brain associated with acceleration and deceleration when the head is moved. **(Van Loveren et al, 1992)**

The falx cerebri is a sickle-shaped fold of dura mater that lies in the mid line between the two cerebral hemispheres. Its narrow anterior end is attached to the internal frontal crest and the crista galli, its broad posterior part blends in the midline with the upper surface of the tentorium cereblli. The superior sagittal sinus runs in the upper fixed margin and the inferior sagittal sinus runs in the lower concave free margin and the straight sinus runs in the attachment to the tentorium cerebelli . **(Seoane et al, 1998)**

The tentorium cerebelli is a crescent-shaped fold of dura mater that roofs over the posterior cranial fossa. It covers the upper surface of the cerebellum and supports the occipital lobes of the cerebral hemispheres. In the anterior edge there is a gap the tentorial notch for the passage of the mid-brain, which forms an inner free border and an outer attaced or fixed border. The fixed border is attached to the posterior clinoid processes,the superior borders of the petrous bones and the margins of the groove for the transverse sinuses on the occipital lobes. **(Seoane et al., 1998)**

The free border runs forwards as its two ends crosses the attached border to become attached to the anterior clinoid processes on both sides. At the point of attachment of the free and the attached borders the third and the fourth cranial nerves emerge and enter the lateral wall of the cavernous sinus **(Kim et al., 2000)**.

Close to the apex of the petrous part of the temporal bone the lower layer of the tentorium is pouched forward beneath the superior petrosal sinus to form a recess for the trigeminal nerve and trigeminal ganglion. **(Seoane et al., 1998)**

The falx cerebri and the falx cerebelli are attached to the upper and lower surfaces of the tentorium respcectively. The straight sinus runs along its attachment to the falx cerebri,the superior petrosal sinus runs along its attachment to the petrous bone,and the transverse sinus runs along its attachment to the occipital bone. **(Miller et al., 1993)**

The falx cerebelli is a small sickle-shaped fold of dura mater attached to the internal occipital crest and projects forward between the two cerebellar hemispheres. Its fixed posterior margin contains the occipital sinus. **(Van Loveren et al, 1992)**.

Dural nerve supply

The dura mater receives nerve supply from branches of the trigeminal ,vagus ,hypoglossal,facial,glossopharyngeal and the first three cervical spinal nerves and braches from the sympathetic trunk pass to the dura. **(Bouthillier et al., 1996)**

The dura possesses numerous sensory endings that are sensitive to stretching,which produces sensation of headache. Stimulation of the sensory endings of the trigeminal nerve above the level of the of tentorium cerebelli produces referred pain to an area of skin on the same side of the head.stimulation of the dural endings below the level of the tentorium produces pain referred to the back of the neck and back of scalp along the distribution of the greater occipital nerve. **(Rhoton, 2002)**

Dural arterial supply

Numerous arteries supply the dura mater from the internal carotid, maxillary, ascending pharyngeal, occipital and vertebral arteries. From the clinical standpoint the most important is the middle meningeal artery which can be damaged in head trauma. **(Kim et al., 2000)**.

The middle meningeal artery arises from the maxillary artery in the infratemporal fossa. It enters the cranial cavity through the foramen spinosum and then lies between the endosteal and meningeal layers of the dura. The artery then runs forward and laterally in a groove on the upper surface of the squamous part of temporal bone. The anterior branch deeply grooves or tunnels the anterior-inferior angle of the parietal bone, and its line roughly corresponds to the underlying precentral gyrus of the brain. The posterior branch curves posteriorly and supplies the posterior part of thr dura. **(Renn and Rhoton 1985)**

The meningeal veins run in the enosteal layer of the dura. The middle meningeal vein follows the branches of the middle middle meningeal artery and drains into the pterygoid venous plexus or the sphenopairetal sinus. The veins lie lateral to the arteries. **(Seoane et al., 1998)**

Dural venous sinus

The venous sinuses of the cranial cavity are situated between the two layers of the dura mater. Their main function is to receive blood from the brain through cerebral veins and cerebrospinal fluids through the arachnoid villi.the blood in the dural sinuses ultimately drains into the internal jugular veins in the neck. The dural siuses are lined by

endothelium and their walls are thick but devoid of muscular tissue. They have no valves. Emissary veins which are also valve less, connect the dural venous sinuses with diploic veins of the skull and with the viens of the scalp. **(Seoane et al., 1998)**

The superior sagittal sinus occupies the upper fixed border of the falx cerebri. It begins anteriorly at the foramen cecum,where it occasionally receives a vein from the nasal cavity. It runs posteriorly grooving the vault of the skull, at the internal occipital protuberance it turns to one side or the other (usually the right) and becomes continuous with the corresponding transverse sinus. The sinus communicates through small openings with two or three irregular shaped venous lacunae on each side .numerous arachnoid villi and granulations project into the lacunae, which also receive the diploic and meningeal veins. **(Seoane et al., 1998)**

The superior sagittal sinus in its course receives superior cerebral veins. At the internal occipital protuberance it becomes dilated to form the confluence of sinuses. Here the superior sagittal sinus becomes continuous with the right transverse sinus, it is connected to the transversre sinus of the opposite side and receives the occipital sinus. **(Yasargil ,1984)**.

The inferior sagittal sinus occupies the lower free border of the falx cerbri. It runs backwards and joins the great cerebral vein at the free margin of the tentorium cerebella to form the straight sinus. it receives few cerebral veins from the medial surface of the cerebral hemispheres. . **(Seoane et al., 1998)**.

The straight sinus occupies the of junction of the falx cerebri with the tentorium cerebella, it is formed by the junction of the inferior sagittal sinus with the great cerebral vein. It ends by turning to the left (sometimes to the right) to form the transverse sinus. **(Kim et al., 2000)**

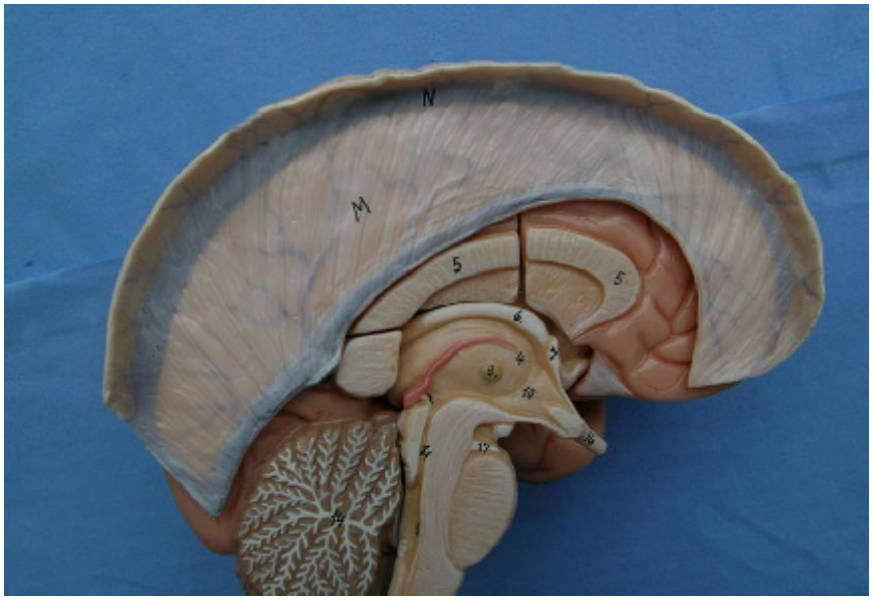
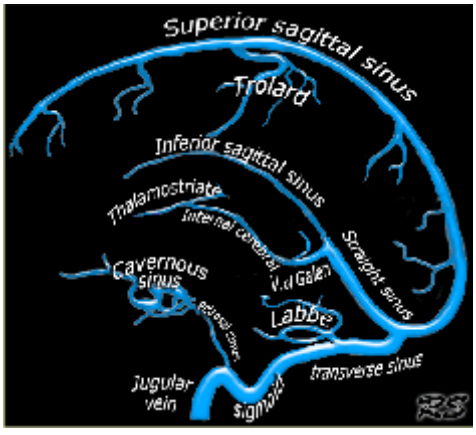


Fig. (1): Mid line Sagiital section. N: Superior sagittal sinuse, M: Falx cerebri,4:posterior cerebral artery, 5: corpus callosum, 6: fornix, 7: lamina terminalis, 9:interthalamic connection ,10: hypothalamus, 11:aqueduct of sylvius, 14: cerebellum, 16: pituitary stalk, 17: optic nerve. .**(Kim et al., 2000)**



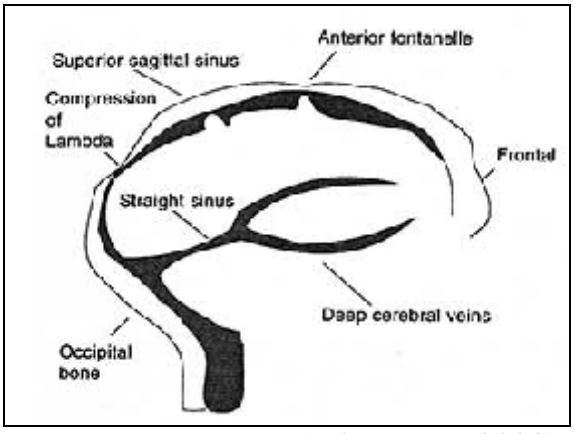


Fig. (2): Diagramtic view showing dural venous sinuses. **(Kim et al., 2000)**

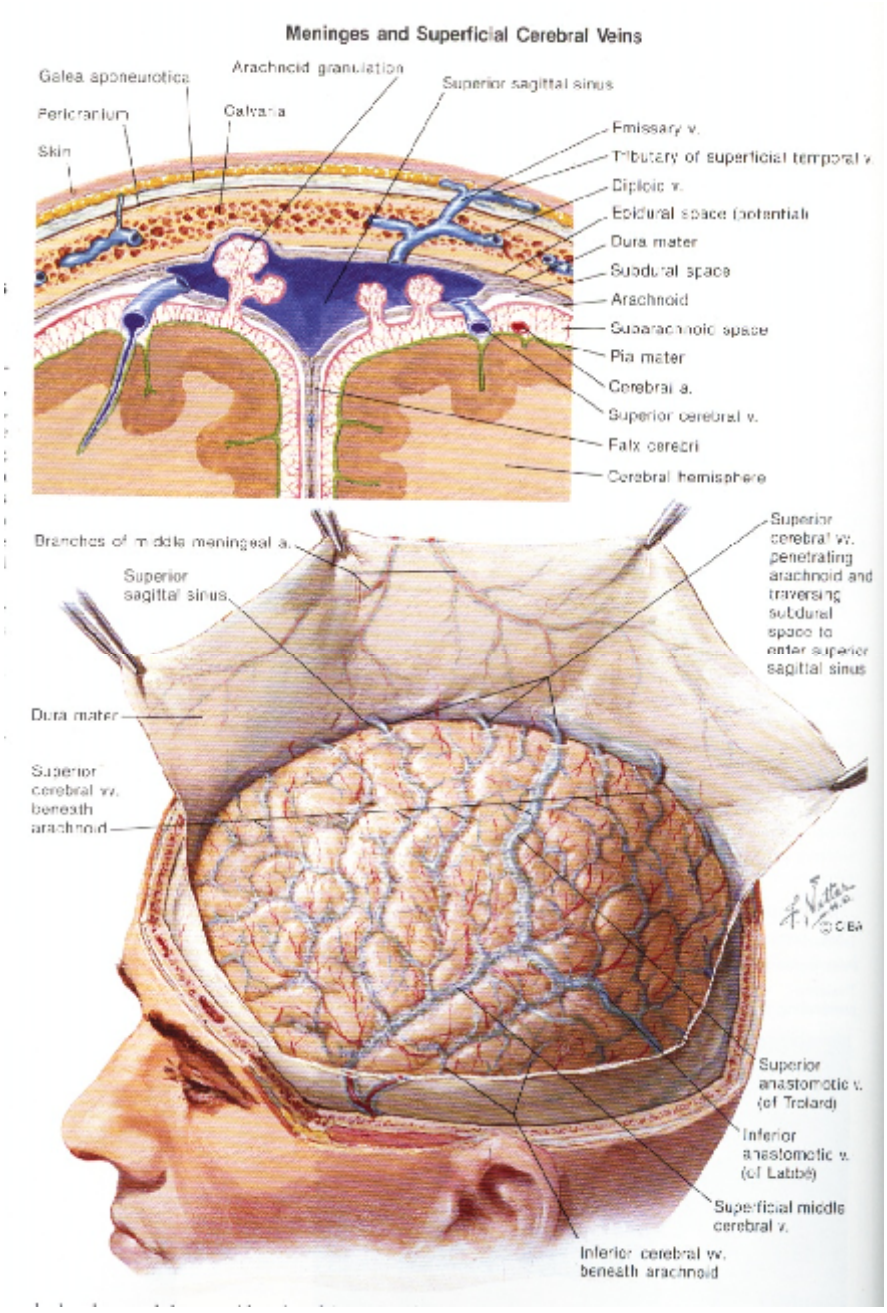


Fig. (3): Meninges and superficial cerebral veins**. (Seoane et al., 1998)**