Parasagittal central gyrus region meningioma

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It is a parasagittal meningioma that involves the falx, sinus, and falx-sinus meningiomas in middle one third of the sagittal sinus, and the cerebral convexity meningioma is in the precentral gyrus and postcentral gyrus.

The tumor is located in the paracentral cortex, close to the superior sagittal sinus, and closely associated with the central sulcus vein and other important draining veins.

Clinical Features

Epilepsy is a common primary symptom in those patients.

Diagnosis

Preoperative CT and MRI can be used to check tumor size; compression degree on brain tissues; and smoothness of the sagittal sinus, the cortex gyrus veins, and the feeding artery.

Magnetic resonance venogram helps to understand the smoothness degree after the sagittal sinus is affected and the path of surrounding gyrus veins. These examinations help to process the sagittal sinus and draining veins intraoperatively and help to establish an operation scheme.

MR angiography (MRA), DSA and CT angiography (CTA) are utilized to determine the position of the Rolandic vein and tumor blood supply and the status of the sagittal sinus and collateral circulation [1) 2)]

Treatment

In the surgical therapy for central gyrus region meningioma with epilepsy as the primary symptom, the objective is to protect the brain functions, resect meningioma, and prevent seizure of epilepsy [3) 4) 5)].

The treatment procedure requires the maximization of tumor tissue removal, as well as improved protection of the central gyrus brain tissue, Rolandic vein and draining vein, and the effective treatment of the sagittal sinus [6)].

Microsurgery is the first therapeutic choice for the resection of meningioma. However, attention should be paid not only to the total excision alone but also to the intraoperative safety and postoperative quality of life and especially to the protection of the paracentral cortex, central sulcus vein, and other important draining veins [7) 8)].

Dura is cut carefully to isolate and expose tumor tissues, and adhesion is isolated from the shallower to the deeper along the arachnoid space; meanwhile, wet cotton is displaced with the filling between

the tumor wall and the arachnoid so as to help isolate tumor and protect brain functions.

If the central sulcus vein is located in 1 side of the tumor, it can be easily protected; but if it adheres closely to the tumor, the arachnoid can be cut under microscope along the 2 sides of the vein to loosen the veins, and then the tumor tissues in front and behind the vein are resected into masses so as not to severely damage the central sulcus vein. If the tumor adheres strictly to the veins and cannot be isolated, then tumor slices can be reserved to avoid damage to the veins.

If an affected superior sagittal sinus is not processed, it is a major cause to postoperative recurrence, and thus, it is very important to correctly process the sagittal sinus. There are 2 relations between meningioma and sagittal sinus:

1.-The tumor invades the sagittal sinus, whereas the sinus grows inward, in front of the coronal suture in the upper one third of the sagittal sinus, and despite the smooth degree of sagittal sinus, the sagittal sinus can be resected together.

However, when the tumor invades the middle or the last one third of the sagittal sinus, the sinus is incompletely occluded [9].

Following a reduction in the tumor size and intravenous tension, the tumor capsule has to be completely removed. During the separation process, the peritumoral normal brain tissue and the cerebral pia mater must be effectively protected, and the aspiration method, which may damage the central gyri, must not be performed [10) 11) 12)].

In cases where the Rolandic vein is damaged, venous anastomosis or autogenous vein grafting must be performed [13)].

Treatment of the involved sagittal sinuses

Many studies proposed to resect the unilateral sagittal sinus wall and repair with duramater or excise the sagittal sinus and fit with autologous vein or artificial blood vessel. Most scholars advocate reserving a part of the tumor, slowly closing the superior sagittal sinus, and resecting the remaining tumor after collateral circulation is established [14) 15) 16) 17) 18) 19) 20)].

Principles of treatment:

i) In cases where the tumor has only invaded the outer wall of the sagittal sinus, electrocautery is performed on the attaching wall following tumor removal, accompanied by saline washes.

ii) If the tumor has invaded the whole sinusoidal wall or entered the sinus cavity, the tumor tissue in the sinus cavity and the involved sinus wall are removed, under conditions of adequate blood source and controlled blood pressure.

The direct suture is conducted on the small sinus wall gap. If the sinus wall gap is bigger, the reconstruction of the sinus wall is performed with the fascia or artificial dura mater, and gelatin sponges and biological glue are used to reinforce the sinus wall.

iii) If the sinus cavity is completely blocked with a fine peripheral venous return compensation, the blocked section of the sagittal sinus is removed together with the tumor [21) 22)].

Intraoperative Monitoring

The SEP phase reversal of N20-P20 is a simple and reliable technique, but the success rate is much lower in large central and postcentral tumours. With the use of polyphasic late waveforms the sensorimotor cortex may be localised. By contrast with motor electrical mapping it is less time consuming. Functional neuronavigation is a desirable tool for both preoperative surgical planning and intraoperative use during surgery on perirolandic tumours, but compensation for brain shift, accuracy, and cost effectiveness are still a matter for discussion [23].

Complications

The surgery may damage the cortex in the functional area or affect the gyrus veins in the cortex, which greatly increases the risks of postoperative disability and severe surgical complications

The central sulcus vein guides the venous blood from the central gyrus to the sagittal sinus, and thus, a damage to the central sulcus vein may cause bleeding and permanent hemiplegia. [24] [25].

Post-operative complications, including paralysis, coma, cerebral edema and hemorrhagic infarction, are often associated with venous system injuries [26] [27]

Case series

2013

A microsurgical technique was used to treat 26 patients with large parasagittal meningioma in the central gyrus region. The Rolandic and draining veins and the peritumoral normal brain tissue were retained, and the associated sagittal sinus was appropriately protected. A Simpson grade I, II or III resection was performed in 8 (30.8%), 12 (46.2%) and 6 (23.1%) patients, respectively, with no post-operative mortalities. Following treatment, 9 patients exhibited hemiparalysis. No tumor recurrence was found in 21 patients during the follow-up examination. The treatment protocol described in the current study included sufficient pre-operative imaging evaluations, a skilled microsurgical technique, improved protection of the Rolandic vein and treatment of the sagittal sinus, and was found to significantly increase the total tumor removal rate and decrease post-operative recurrence [28].

2003

A total of 13 consecutive patients with lesions adjacent to the pyramidal tracts and the central region underwent microneurosurgery with the help of pyramidal tract visualization (PTV). An ADW sequence obtained preoperatively was fused to an anatomic navigation sequence. The 3-D reconstructions of the precentral gyrus (PG), the pyramidal tract, and the tumor were available in a customized neuronavigation system during surgery. Intraoperatively the PG was identified on the basis of the aforementioned data. Electric motorcortex stimulation (CS) was used to directly verify the PG location and indirectly the fiber tract position.

In 11 cases (92%) the prediction of the principal motor pathways' position was correct. In one case of a meningioma, according to PTV, the tumor was falsely localized postcentrally. In the case of a

precentral cavernoma, no motor response could be elicited by cortical stimulation.

Intraoperative PTV on the basis of ADW provides the neurosurgeon with reliable information concerning the position of the principal motor pathways during intracranial procedures as proved with intraoperative electrophysiological testing. The technique has the potential to reduce operative morbidity. PTV is straightforward and can be adapted to other customized neuronavigation devices [29].

Videos

<html><iframe width="420" height="315" src="https://www.youtube.com/embed/rEM5WdCjDZ8" frameborder="0" allowfullscreen></iframe></html>

Dr.Suresh Dugani This 40 yrs man left froto-parietal parasagital meningioma on motor area ,infiltrating into superior sagital sinus, this was excised microsurgically with navigation assistance,with excellent outcome

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