Intraventricular Arteriovenous Malformation

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Ventricular arteriovenous malformations (AVMs) are localized in the ventricles and are mainly fed by the anterior choroidal artery (AChoA) and posterior choroidal artery (PChoA).

Epidemiology

Ventricular arteriovenous malformations (AVMs) are rare and account for 5–19% of all cerebral arteriovenous malformations [1].

Classification

The classification of intraventricular AVMs is typically based on their location within the ventricles and their associated characteristics. Here are some common classifications for intraventricular AVMs:

Location within Ventricles:

Intraventricular AVM: This is a general classification for AVMs located within the ventricular system. Intraventricular AVM of the lateral ventricles: A specific classification indicating that the AVM is located within the lateral ventricles.

Size and Complexity:

Simple Intraventricular AVM: Refers to relatively smaller and less complex AVMs within the ventricles. Complex Intraventricular AVM: Indicates larger and more intricate AVMs that may involve multiple blood vessels and have a higher risk of complications.

Hemorrhage Risk:

Hemorrhagic Intraventricular AVM: A classification emphasizing that the AVM has a higher risk of bleeding or hemorrhage. Non-hemorrhagic Intraventricular AVM: Indicates that the AVM has not caused bleeding.

Symptoms and Clinical Presentation:

Asymptomatic Intraventricular AVM:f Some AVMs may not cause noticeable symptoms and are discovered incidentally during brain imaging for other reasons.

Symptomatic Intraventricular AVM: Refers to AVMs that cause symptoms such as headaches, neurological deficits, or seizures. Feeding Arteries and Drainage Patterns:

A more detailed classification might describe the specific arteries that feed the AVM and the veins through which it drains, as these factors can influence treatment decisions.

Associated Complications:

Some classifications may consider associated complications, such as hydrocephalus (accumulation of cerebrospinal fluid) caused by the AVM obstructing normal CSF flow. It's important to note that the classification of intraventricular AVMs can vary among medical institutions and may evolve as our understanding of these conditions advances. The specific classification used by a healthcare provider or medical facility will depend on their assessment of the AVM's characteristics and the information available from imaging studies, such as angiograms and MRI scans. Treatment decisions are often influenced by the classification of the AVM, as well as the patient's overall health and symptoms.

Treatment

see also Cerebral arteriovenous malformation treatment.

Treatment options may include surgical resection, endovascular embolization, radiosurgery, or a combination of these approaches, depending on the individual case.

Intraventricular Arteriovenous Malformation embolization

The outcomes of stereotactic radiosurgery for arteriovenous malformations (AVMs) within or adjacent to the ventricular system are largely unknown. This study assessed the long-term outcomes and hemorrhage risks for patients with AVMs within this region who underwent Gamma Knife surgery (GKS) at the University of Pittsburgh.

Methods: The authors retrospectively identified 188 patients with ventricular-region AVMs who underwent a single-stage GKS procedure during a 22-year interval. The median patient age was 32 years (range 3-80 years), the median target volume was 4.6 cm(3) (range 0.1-22 cm(3)), and the median marginal dose was 20 Gy (range 13-27 Gy).

Results: Arteriovenous malformation obliteration was confirmed by MRI or angiography in 89 patients during a median follow-up of 65 months (range 2-265 months). The actuarial rates of total obliteration were 32% at 3 years, 55% at 4 years, 60% at 5 years, and 64% at 10 years. Higher rates of AVM obliteration were obtained in the 26 patients with intraventricular AVMs. Twenty-five patients (13%) sustained a hemorrhage during the initial latency interval after GKS, indicating an annual hemorrhage rate of 3.4% prior to AVM obliteration. No patient experienced a hemorrhage after AVM obliteration was confirmed by imaging. Permanent neurological deficits due to adverse radiation effects developed in 7 patients (4%).

Conclusions: Although patients in this study demonstrated an elevated hemorrhage risk that remained until complete obliteration, GKS still proved to be a generally safe and effective treatment for patients with these high-risk intraventricular and periventriclar AVMs [2)].

Case series

Nine cases with arteriovenous malformations (AVM's) predominantly involving the lateral ventricle are presented. All the AVMs were small but caused intraventricular hemorrhage in eight cases. Only two patients had an intracerebral hemorrhage large enough to warrant evacuation. Eight patients were under the age of 40 years at the onset of their disease. Computerized tomography demonstrated intraventricular hemorrhage in eight patients, and after intravenous administration of contrast medium a small area of enhancement with dilated subependymal draining veins was seen in seven. The lateral ventricles were of normal size in seven cases, and only two patients required a shunting procedure. Angiography demonstrated that the lesion was an AVM in eight patients, and did not visualize the lesion in the ninth. One patient suffered a recurrent intraventricular hemorrhage when the AVM was demonstrated, although repeated angiography had failed to disclose a vascular lesion at his first intraventricular hemorrhage 14 months before. All nine lesions were resected by microsurgical techniques, and the results were excellent in eight patients. Of four caudate lesions, three were resected through a frontal transcortical approach and the other was operated on through an anterior transcallosal approach; the results were excellent in three of these patients. Only one (Case 4) was left with neurological deficits; he had confusion and disorientation following a right frontal transcortical approach. Even in the dominant hemisphere, lesions in the head of the caudate nucleus could be safely resected by an anterior transcallosal approach. Two choroidal lesions located in the temporal horn and trigone on the dominant side were resected through a middle temporal gyrus approach, and three thalamic lesions through a posterior transcallosal approach, all with excellent results. In all cases the brain opening required was about the width of the retractor (maximum 2.0 cm, average 1.5 cm) [3)].

Case reports

A case of a previously ruptured arteriovenous malformation (AVM) of the 4th ventricle that was surgically resected via a retrosigmoid craniotomy and trans-inferior cerebellar peduncular (ICP) approach. The patient is a 54-year-old female who experienced an intraventricular hemorrhage several months prior to presentation to our institution. Imaging studies suggested the presence of an AVM located in the right lateral recess of the 4th ventricle. After a discussion of all possible treatment options, the patient elected to proceed with surgical resection. To access the lesion, they performed a retrosigmoid craniotomy and entered into the 4th ventricle via s small incision in the inferior cerebellar peduncle. Post-operative imaging demonstrated complete removal of the AVM nidus. The video demonstrates this approach and discusses the anatomic landmarks used to guide resection [4].

Case reports from the HGUA

Title: Complex Subarachnoid Hemorrhage Management in a Patient with a Suspected Paraventricular Arteriovenous Malformation: A Fatal Outcome

Introduction

Subarachnoid hemorrhage (SAH) is a neurological emergency associated with high morbidity and mortality. Arteriovenous malformations (AVMs) are a known cause of SAH. This case report presents a complex clinical scenario of SAH, intraventricular hemorrhage, and a suspected left paraventricular AVM, emphasizing the challenges in managing such cases.

Case Presentation

Patient Information:

Gender: Female Age: 38 years Medical History:

The patient had no significant medical history, previous surgeries, or regular medical treatment. She was a smoker with a consumption of 5 cigarettes per day.

Clinical History:

The patient presented with a holocranial headache persisting for a week, accompanied by photophobia. She had previously sought medical attention at another hospital, where a CT scan and cerebral angiography revealed a tetra intraventricular hemorrhage associated with a possible left paraventricular AVM.

ICU Course

Upon admission to the Intensive Care Unit (ICU), the patient had stable vital signs:

Blood Pressure (BP): 132/61 mmHg Heart Rate (HR): 54 beats per minute Oxygen Saturation (SpO2): 99% on room air Temperature (Temp): 36°C Physical examination showed the patient to be conscious and oriented, with a Glasgow Coma Scale (GCS) score of 15 points. No neurological focal deficits, cranial nerve abnormalities, or new motor/sensory deficits were observed.

Diagnostic Findings

CT Brain Scan:

A diffuse Fisher IV subarachnoid hemorrhage with intraventricular hemorrhagic material in various brain ventricles was identified. A possible left paraventricular AVM was suggested.

Cerebral Angiography:

Cerebral angiography confirmed the presence of an arteriovenous malformation in the left lateral ventricle system. It was supplied by the left anterior cerebral artery (ACA) and drained into deep cerebral veins, straight sinus, and the falx cerebri.

Treatment

Transarterial embolization of the left pericallosal artery was performed using Onyx. During the procedure, a venous perforation in the AVM drainage vein resulted in intraventricular bleeding. Despite attempts to correct the perforation, a global cerebral perfusion defect with increased intracranial pressure (ICP) developed.

Outcomes

Successful closure of the left paraventricular AVM was achieved. A venous perforation with intraventricular bleeding was observed. A global cerebral perfusion defect and increased ICP indicated a severe complication.

Comments

The patient was transferred to the ICU for continuous monitoring due to her critical condition. The possibility of deep cerebral venous thrombosis was considered as an explanation for the increased ICP and cerebral edema.

Discussion

This case report underscores the complexities in managing SAH cases associated with AVMs, especially when intraventricular hemorrhage and procedural complications occur. It highlights the crucial role of a multidisciplinary approach, involving neurosurgery and interventional radiology, in managing such patients. A comprehensive diagnostic and therapeutic strategy, including timely intervention, is essential to optimize outcomes in these challenging scenarios. Despite the successful closure of the AVM, the patient's outcome was tragic due to the complications encountered during the procedure, emphasizing the critical nature of such cases.

1)
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