Petrous apex dural arteriovenous fistula

Diagnosis

At CT, intraosseous dural arteriovenous fistulas appear as osteolytic lesions. MR imaging demonstrates multiple intraosseous flow voids and contrast-enhanced images show serpentine enhancement in the affected diploic space, findings suggestive of intradiploic venous hypertension. Time of flight magnetic resonance angiography demonstrates flow-related enhancement within intraosseous vessels and a dilated intraosseous venous pouch [1)].

Treatment

These lesions may be treated surgically or with endovascular occlusion [2)]

Outcome

Dural arteriovenous fistulas (DAVFs) at the petrous apex are rare but may cause subarachnoid hemorrhage (SAH) or severe brainstem edema..

Case series

A study of Li et al., from the Department of Neurosurgery, Xuanwu Hospital, Capital Medical University, Beijing, People's Republic of China, aimed to summarize their clinical features and discuss the classification.

During a 15-year period, 64 consecutive patients with DVAF at the petrous apex were reviewed. According to their angioarchitecture, these cases were classified as follows: Type I, no venous ectasia (48.4%); Type II, venous ectasia but with normal vein proximal to the fistula (29.7%); Type III, venous ectasia at the site of fistula (21.9%).

53 male and 11 female patients were included. Presented symptoms were subarachnoid hemorrhage (SAH) in 8 patients (12.5%), nonhemorrhagic neurologic defects (NHND) in 53 patients (82.8%), and no symptom in 3 patients (4.7%). 49 patients received transarterial embolization, 8 patients received microsurgery, and 7 patients received embolization and microsurgery. Complications occurred in 9 patients (14.1%), including transient cranial nerve palsy (4.7%), rebleeding (6.3%), and respiratory failure (3.1%). 96.77% of type I patients presented with NHNDs and 77.42% of them with an infratentorial drainage. However, SAH occurred more often in type II/III cases (21.05%/28.57%) and most patients carried a supratentorial drainage (63.16% and 85.71%). In different types of DVAF, the necessity for embolization combined with microsurgery (6.45% in type I, 10.53% in type II, 21.43% in type III) and the occurrence of rebleeding complication (0% in type I, 10.53% in type II and 14.29% in type III) were varied.

Petrous apex DAVF carried a high risk of embolization-related complications. Based on the vascular

architecture, this classification may reflect their clinical features and provide some advices on the treatment of DVAFs at the petrous apex [3].

Four patients with DAVFs at the petrous apex from the Department of Neurosurgery, University of Wuerzburg, Germany.

One patient was admitted with cerebral hemorrhage from a second occipital DAVF, and three patients had cranial nerve palsies. All fistulas were type III or IV according to Cognard classification with venous drainage into the deep cerebral veins.

Transarterial embolization was performed in two patients. Partial transarterial embolization was possible resulting in a marked flow reduction. In one further patient, surgical treatment via a subtemporal approach was attempted, but complete obliteration of the fistula was impossible. In all patients, complete occlusion of the DAVF was achieved by surgical interruption via a standard retrosigmoid approach to the cerebellopontine angle.

Treatment of these type III or IV DAVFs was indicated. The fistulas were supplied by multiple meningeal feeders originating from the external and internal carotid and vertebral arteries. Preoperative transarterial embolization resulted in significant flow reduction. Complete cure at low risk was achieved by interruption of the venous drainage via a retrosigmoid approach [4].

[1] [2]
Razek AA, Huang BY. Lesions of the petrous apex: classification and findings at CT and MR imaging. Radiographics. 2012 Jan-Feb;32(1):151-73. doi: 10.1148/rg.321105758. PubMed PMID: 22236899.
[3]
Li J, Ren J, Du S, Ling F, Li G, Zhang H. Dural arteriovenous fistulas at the petrous apex. World Neurosurg. 2018 Aug 10. pii: S1878-8750(18)31793-5. doi: 10.1016/j.wneu.2018.08.012. [Epub ahead of print] PubMed PMID: 30103057.
[4]
Westermaier T, Bendszus M, Solymosi L, Roosen K, Ernestus RI. Surgical treatment of dural arteriovenous fistulas of the petrous apex. World Neurosurg. 2012 Mar-Apr;77(3-4):591.e7-13. doi: 10.1016/j.wneu.2011.07.009. Epub 2011 Nov 7. PubMed PMID: 22120334.