Persistent primitive trigeminal artery

Persistent trigeminal artery (PTA) is the most common remnant of primitive circulation communicating the developing carotid and vertebrobasilar junction.

Seen in ≈ 0.6% of cerebral angiograms. The most common of the persistent fetal anastomoses (83%). May be associated with trigeminal neuralgia. Connects the cavernous carotid to the basilar artery. Arises from the ICA proximal to the origin of the meningohypophyseal trunk (50% go through sella, 50% exit the cavernous sinus & course with the trigeminal nerve) and connects to the upper basilar artery between AICA & SCA. The VAs may be small.

It is critical to recognize a PPTA before doing a Wada test because of the risk of anesthetizing the brainstem, and in doing transsphenoidal surgery because of the risk of arterial injury. May rarely be an explanation of posterior fossa symptoms in a patient with carotid disease

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Although discovered incidentally, an altered hemodynamic may lead to an increased association of aneurysms, vascular malformations and stroke. Neurosurgeons should be aware of the presence and significance of PTA while interpreting imaging and planning interventions.

The study of Tyagi et al. is one of the largest describing the incidence of PTA. They emphasized on the importance of PTA to the neurosurgeons, increased association of aneurysms, as a route for intervention in occlusive disease of posterior fossa, risk of injury and bleeding during transsphenoidal surgeries and the association with trigeminal neuralgia (TN). However, they found that only PTA variants are likely to be associated with TN due to their cisternal course causing NV conflict [1].

Persistent primitive trigeminal artery (PTA) is the most frequent embryonic communication between the internal carotid artery and vertebrobasilar systems.

It is present in 0.1-0.6% of cerebral angiograms and is usually unilateral.

In utero the trigeminal artery supplies the basilar artery before development of the posterior communicating artery and vertebral arteries. The PTA arises from the junction between petrous and cavernous ICA, and runs posterolaterally along the trigeminal nerve (41%), or crosses over or through the dorsum sellae (59%). Vertebral, posterior communicating and caudal basilar arteries are often hypoplastic.

A characteristic 'tau sign' is described as its appearance on sagittal MR images.

There is an association with intracranial aneurysms and vascular malformations.

Flow-Diverter Stent for an Unruptured Aneurysm at the Junction of the Internal Carotid Artery and Persistent Primitive Trigeminal Artery: A Case Report and Literature Review [2].

However, hormonal changes or the association of PTA with other sellar lesions, such as pituitary neuroendocrine tumors, are extremely rare.

Persistent trigeminal artery (PTA) is a rare but important anatomic variant that contributes to trigeminal neuralgia (TN). Microvascular decompression (MVD) of the responsible vessel(s) away from the trigeminal nerve provides the most complete and durable relief from TN. The role and technique of MVD for TN associated with a PTA has not been fully defined in the literature.

Ma et al. report the first 3-dimensional (3D) microscopic video and first intraoperative endoscopic video of a successful MVD of the trigeminal nerve in a patient who suffered TN from a tortuous, compressive PTA.

CLINICAL PRESENTATION: A 66-yr-old right-handed female presented with right facial pain in V2 and V3 distributions with a clinical picture of TN. Imaging demonstrated trigeminal nerve compression secondary to a PTA and MVD was performed with a 3D operative microscope and an endoscope. The PTA appeared to compress the nerve directly at the trigeminal porus and also had compressive superior cerebellar artery variant branches. The nerve was decompressed at all points of compression with Teflon pledgets along its entire cisternal length. Postoperatively, she is free with trigeminal pain episodes at 4-mo follow-up.

CONCLUSION: In cases of TN associated with a PTA, we recommend decompression along the entire length of the nerve wherever there is compression. Furthermore, we find both the operative microscope and particularly the endoscope useful to assess vascular anatomy intraoperatively [3].

Two patients with intrasellar PTA and simultaneous pituitary neuroendocrine tumor

Case 1. A female patient, 41 years old, was admitted with a history of chronic headache (> 20 years). Pituitary magnetic resonance imaging (MRI) showed a rounded lesion in the left portion of the pituitary gland suggestive of adenoma (most likely clinically nonfunctioning pituitary neuroendocrine tumor). In addition to this lesion, the MRI demonstrated ectasia of the right internal carotid artery and imaging suggestive of an intrasellar artery that was subsequently confirmed by an angio-MRI of the cerebral vessels as PTA.

Case 2. A female patient, 42 years old, was admitted with a history of amenorrhea and galactorrhea in 1994. Laboratorial investigation revealed hyperprolactinemia. Pituitary MRI showed a small hyposignal area in the anterior portion of pituitary gland suggestive of a microadenoma initiated by a dopaminergic agonist. Upon follow-up, aside from the first lesion, the MRI showed a well delineated rounded lesion inside the pituitary gland, similar to a vessel. Angio-MRI confirmed a left primitive PTA. Failure to recognize these anomalous vessels within the sella might lead to serious complications during transsphenoidal surgery. Therefore, although their occurrence is uncommon, a working knowledge of vascular lesions in the sella turcica or pituitary gland is important for the differential diagnosis of pituitary lesions, especially pituitary neuroendocrine tumors [4].

Case series

Tyagi et al. retrospectively reviewed all MRA and cerebral DSA done between 2012 and 2017 for the presence of PTA. The radiological and anatomical details were noted and analyzed along with the clinical profiles. They categorized the radiological findings with respect to the available classification systems. A review of the available literature was done comparing there results.

They found 33 cases of incidentally detected PTA. Average age of the patients was 45.42years. The lateral surface of the proximal Cavernous ICA was the most common origin (n=23). Only 3 cases had a medial/trans-sellar course. Maximum cases were Saltzman/Weon type-I (19/33). Intracranial aneurysms were associated with 6 patients (18.18%). Trigeminal Neuralgia was presenting feature in 5 patients. None of them had a direct neurovascular (NV) conflict at the REZ.

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Variants

Persistent primitive trigeminal artery variants.

[1], [5]
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