A Case of Superficial Recurrent Ophthalmic Artery Supplying an Infratentorial Vascular Tumour

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Summary

We present a case of ophthalmic artery contribution to a posterior fossa vascular tumour by the superficial recurrent ophthalmic artery. This branch arises from the second portion of the ophthalmic artery and is rarely seen on angiography. We review the anatomy and embryology of this arterial variant. Furthermore, this case illustrates the capacity of the ophthalmic artery to supply posterior fossa neoplasms.

Case Report

A 50-year-old woman presented with a three month history of unsteadiness of gait. Magnetic resonance (MR) scan revealed an infratentorial extra-axial vascular tumour in the left cerebellopontine angle (figure 1). Prominent vascular flow voids were noted within and around it. The patient underwent selective internal carotid and external carotid angiography for preoperative demonstration of vascular anatomy and devascularisation of the tumour. The blood supply to the tumour was largely from the middle meningeal and occipital branches of the external carotid artery. Left internal carotid artery (ICA) injection demonstrated vascular blush in the anterosuperior quadrant of the tumour. A prominent superficial recurrent ophthalmic artery (SROA) was seen to arise from

the second portion of the ophthalmic artery (OA). It coursed posterolaterally to supply the tumour (figure 2). There was no significant contribution from the meningohypophyseal trunk or from the vertebrobasilar circulation. The external carotid branches to the tumour were effectively occluded with polyvinyl alcohol particles.

Discussion

The development of the orbital vasculature is strictly linked to the embryology of the vessels to the cavernous sinus and exhibits a close reciprocal relationship to the development of middle meningeal artery (MMA).

The primitive ophthalmic artery is formed by anastomoses between the ventral and the dorsal ophthalmic arteries which arise from the anterior cerebral artery and the carotid siphon respectively. The proximal part of the ventral ophthalmic artery regresses and then arises from the supracavernous segment of the internal carotid artery. The dorsal ophthalmic artery regresses at the superior orbital fissure and its remnant is the inferolateral trunk (ILT).

Simultaneous development of the middle meningeal artery and its varying orbital contributions account for two distinct variations in this area. The first is a lacrimal variant in which the lacrimal branch arises from the ophthalmic

Figure 1

Figure 2

artery and anastomoses with the middle meningeal artery branch through the superior orbital fissure. The other is the meningo-lacrimal type where the lacrimal branch arises directly from the MMA¹.

The complex embryology accounts for the numerous variations encountered in the cavernous region and it is important to recognise persistent anastomotic channels between internal and external carotid branches.

1. The superficial recurrent ophthalmic artery which arises from the ophthalmic or the lacrimal artery and anastomoses with the MMA via the superior orbital fissure (SOF).

2. The meningo-ophthalmic artery arising directly from the MMA and anastomosing with the intra-orbital ophthalmic artery.

3. The deep recurrent ophthalmic artery which is formed by persistence of the dorsal ophthalmic artery inside the orbit. The ICA anastomoses with the medial branches of the MMA.

4. Artery of the foramen rotundum and other trans-sphenoidal branches of the internal maxillary artery may anastomose with the cavernous branches of the internal carotid artery.

5. Potential contributions to the marginal tentorial artery from the carotid siphon, ILT, accessory meningeal and MMA and intraorbital ophthalmic and lacrimal arteries^{2,3}.

The ophthalmic artery usually supplies intracranial vascular lesions through ethmoidal and falcine branches to tumours around the floor of the anterior cranial fossa^{14, 51}. Rarely anomalous meningeal branches of the ophthalmic artery have been demonstrated to supply brain convexity meningiomas⁶. The deep recurrent ophthalmic artery, a remnant of the dorsal ophthalmic artery, has been demonstrated to feed a paraclinoid meningioma⁷. Our case illustrates the potential of the superficial recurrent ophthalmic artery to supply posterior fossa vascular lesions. This artery arises from the second portion of the ophthalmic artery or the proximal portion of the lacrimal artery⁷. It passes through the SOF to anastomose with the MMA in the cavernous region to form the recurrent meningeal artery. It then assumes the

path followed by the marginal tentorial artery. Finally, it contributes to the blood supply of the posterior fossa tumour.

There are some distinctive features of this case. It confirms the reciprocal relationship between the marginal tentorial branch from the SROA which would preclude the development of same ramus from another trunk. The potential for involvement of the SROA in vascular lesions at the incisura has been suggested by Lasjunias et Al⁷ and More et Al³ in the advances in cerebral angiography. This case illustrates how an enlarged SROA can supply blood to posterior fossa lesions.

Conclusions

The superficial recurrent ophthalmic artery is a branch of the second portion of the ophthalmic artery that is not routinely visualised on angiography. It contributes towards the marginal tentorial anastomosis and hence is a potential supply of blood to the posterior fossa.

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EDITORIAL COMMENT

This is an interesting clear and objective article illustrating how dynamic arterial anastomosis is at dura mater level, even when foreseeable. Still, it reinforces the need to include internal and external carotid angiograms in the presence of infratentorial vascular lesions like tumours and fistulae in cases in which angio-DSA is really needed.

In the reported case, the authors convey the idea that the superficial recurrent branch from ophthalmic artery (OA) anastomoses with the middle meningeal artery (MMA), giving rise to a branch of the free margin of the tentorium which supplies the tumour directly. According to their hypothesis, the meningeal branch of the MMA would run medially (para-cavernous) and continue as the branch of free margin of tentorium.

Actually, this case corresponds to an ophthalmic origin of a distal retrosphenoidal segment of the MMA (running through the superior orbital fissure and via superficial recurrent ophthalmic artery) - a remnant of the orbital branch of the stapedia artery, which retrogradely approaches the spinous foramina. It gives rise to the petrous branch, and behind the petrous pyramid its tentorial collateral branch supplies the tumour. In other words, the remnant represents a partial ophthalmic origin of the MMA that at that point runs laterally (on the dura of the great wing of the sphenoid bone), which is why it does not give rise to a branch of the free margin of the tentorium medially, as interpreted by the authors^{1,2,3}. In any case, it is opportune to recall that vascular lesions of the posterior fossa (e.g., cerebellar haemangioblastoma) can also be supplied by the ICA siphon in the presence of PICA or AICA arteries arising from the carotid siphon via the persistent trigeminal artery⁴.

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