

## THE OPHTHALMIC ARTERY ARISING FROM THE MIDDLE MENINGEAL ARTERY

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Received March 26, 1993

*Summary* : The present report describes a case of variation of the ophthalmic artery observed in a 91-year-old Japanese woman at dissection in 1992. It was found that on one side, the ophthalmic artery originate from the middle meningeal artery, and the ophthalmic artery from the internal carotid artery was absent.

### Index Terms

anomaly, middle meningeal artery, ophthalmic artery

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### INTRODUCTION

Origin of the ophthalmic artery from the middle meningeal artery has been reported both by dissection and by angiography. We<sup>1)</sup> reported previously a case in which the ophthalmic artery originated as two branches of unequal size, the smaller arising from the internal carotid artery and the larger from the middle meningeal artery. The present report describes a case where the ophthalmic artery arising from the internal carotid artery is absent and originates from the middle meningeal artery.

### FINDINGS

A case of variation of the ophthalmic artery was found on the left side in a 91-year-old Japanese woman (cadaver No. 1045) at dissection in 1992. The left ophthalmic artery arising from the internal carotid artery was not seen; the left ophthalmic artery originated from the anterior branch of the middle meningeal artery, and passed through the superior orbital fissure (Fig. 1). The left ophthalmic artery gave off branches in the order of lacrimal, posterior ciliary, central retinal, posterior ethmoidal, supraorbital, anterior ethmoidal and supratrochlear arteries (Figs. 2 and 3). The ophthalmic artery was measured to be 1.9 mm in diameter. As shown in Fig. 1, the diameter of the left internal carotid artery narrowed beyond the original origin of the ophthalmic artery from 6.3 mm to 3.8 mm. The right ophthalmic artery originated normally from the right internal carotid artery.

### DISCUSSION

The anastomosis between the recurrent meningeal branch of the lacrimal artery and the orbital branch of the middle meningeal artery passing through the superior orbital fissure or through a foramen in the greater wing of the sphenoid, is normally present during fetal life<sup>2)</sup>. The embryonic anastomosis is between the supra-orbital branch of the stapedia artery and the ophthalmic artery<sup>3)-5)</sup>. Meyer<sup>2)</sup> found this anastomosis to be present in all twenty cases. It

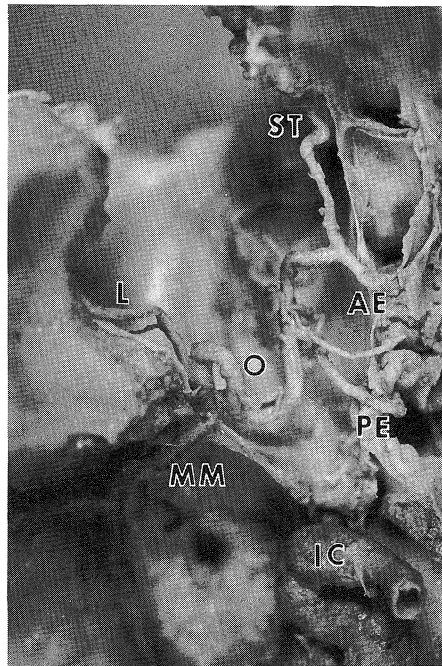


Fig. 1. Superior view of left orbit.

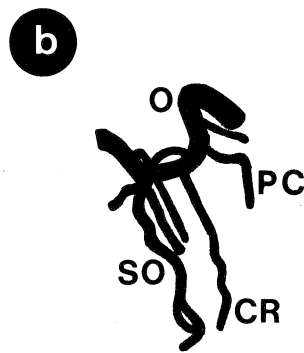
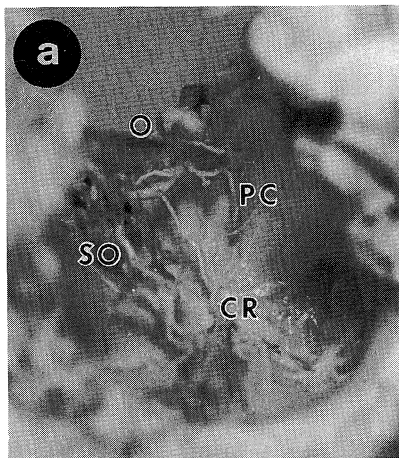


Fig. 2. Anterior view of left orbit. A photograph (a) and schematic presentation (b) of Fig. 2a.

becomes stronger when the ophthalmic artery or its parent trunk is weakly developed or completely degenerated. Therefore, two types of anomaly occur. In the first type, where the ophthalmic artery is completely degenerated, the ophthalmic artery arising from the internal carotid artery is absent and the artery originates from the middle meningeal artery. In the second type, where the ophthalmic artery is weakly developed, the ophthalmic artery originates as two branches of unequal size, the smaller arising from the internal carotid artery and the larger from the middle meningeal artery.

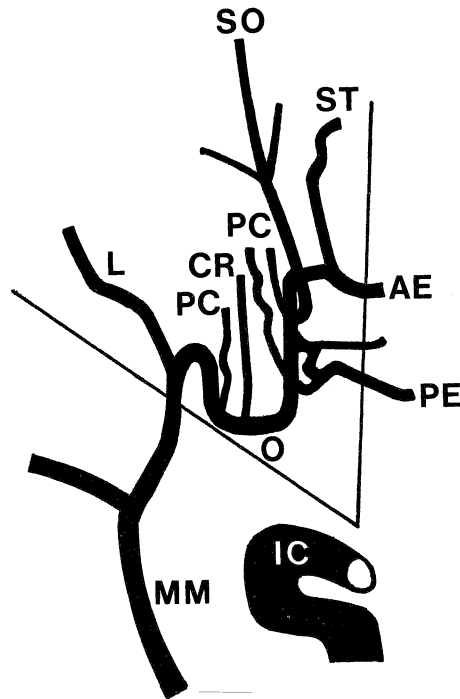


Fig. 3. A schematic presentation of the ophthalmic artery and its branches.

AE: anterior ethmoidal artery, CR: central retinal artery, IC: internal carotid artery, L: lacrimal artery, MM: middle meningeal artery, O: ophthalmic artery, PC: posterior ciliary artery, PE: posterior ethmoidal artery, SO: supraorbital artery, ST: supratrochlear artery.

The first type has been reported at dissection by Dubrueil<sup>6</sup>, Musgrove<sup>7</sup>, Adachi<sup>8</sup>, Whitnall<sup>9</sup>, Harvey and Howard<sup>10</sup>, Hayreh and Dass<sup>11</sup>, and Konishi *et al.*<sup>12</sup>. The present case belongs to the first type. The second type has been reported at dissection by Tiedemann<sup>13</sup>, Luschka<sup>14</sup>, Cruveilhier<sup>15</sup>, Curnow<sup>16</sup>, Adachi<sup>8</sup>, Chanmugam<sup>17</sup>, Priman and Christie<sup>18</sup>, Hayreh and Dass<sup>11</sup>, Hiura<sup>19</sup>, and Tohno *et al.*<sup>1</sup>.

Hayreh and Dass<sup>11</sup> studied the origin of the ophthalmic artery in 170 specimens of the human orbit. In all except six specimens, the ophthalmic artery arose from the internal carotid. They found two cases of the first type of the anomaly and four cases of the second type. We found one case of the first type in 181 cadavers. In the case of anomalous origin of the ophthalmic artery, the diameter of the internal carotid artery narrowed beyond the point of origin of the ophthalmic artery<sup>11</sup>. This was confirmed in the present case.

By arteriography of common and internal carotid arteries there are significant cases<sup>20-31</sup> where the orbital cavity was supplied blood from the middle meningeal cavity.

Dilenge and Ascherl<sup>30</sup>, and Picard *et al.*<sup>26</sup> performed arteriography of the common and internal carotid arteries and found the incident frequency of the ophthalmic artery arising from the middle meningeal artery to be 0.1%.

## REFERENCES

- 1) **Tohno, Y., Tohno, S., Besho, H., Hohki, N., Maeda, Y. and Makino, I.** : J. Nara Med. Ass. **40** : 126, 1989 (in Japanese).
- 2) **Meyer, F.** : Morph. Jb. **12** : 414, 1887.
- 3) **Tandler, J.** : Morph. Jb. **30** : 275, 1902.
- 4) **Evans, H. M.** : Manual Hum. Embryol. **2** : 570, 1912.
- 5) **Padget, D. H.** : Contrib. Embryol. **32** : 207, 1948.
- 6) **Dubrueil, J.M.** : *in* Des anomalies arterielles. Bailliere, Paris, p94-95, 1847. (Cited by Meyer, 1887).
- 7) **Musgrove, J.** : J. Anat. Physiol. (Lond.) **27** : 279, 1893.
- 8) **Adachi, B.** : *in* Das Arteriensystem der Japaner Band I. Kaiserlich Japanischen Universität zu Kyoto, p103-106, 1928.
- 9) **Whitnall, S. E.** : *in* The anatomy of the human orbit. 2nd ed., Oxford University Press, London, p27, 303, and 377, 1932.
- 10) **Harvey, J. C. and Howard, L. M.** : Anat. Rec. **92** : 87, 1945.
- 11) **Hayreh, S. S. and Dass, R.** : Brit. J. Ophthal. **46** : 65, 1962.
- 12) **Konishi, M., Kikuchi, M. and Saheki, M.** : Acta Anat. Nipp. **63** : 70, 1988.
- 13) **Tiedemann, F.** : *in* Tabulae arteriarum corporis humani, Supplementa. Tab. 40, Fig. 4, 1824. (Cited by Meyer, 1887).
- 14) **Luschka, H. von** : *in* Die anatomie des Menschen. vol. 3, pt. 2, Der Kopf, Tübingen, p494, 1867. (Cited by Meyer, 1887).
- 15) **Cruveilhier, J.** : *in* Traite d'anatomie description. 4th. ed., vol. 3, Paris, p97, 1871. (Cited by Meyer, 1887).
- 16) **Curnow, J.** : J. Anat. Physiol. (Lond.) **8** : 155, 1874.
- 17) **Chanmugam, P. K.** : J. Anat. **70** : 580, 1936.
- 18) **Priman, J. and Christie, D. H.** : Anat. Rec. **134** : 87, 1959.
- 19) **Hiura, A.** : Anat. Anz. **147** : 473, 1980.
- 20) **Keller, H. L.** : Fortschr. Geb. Röntgenstrahlen **95** : 472, 1961.
- 21) **Raad, R. de.** : Brit. J. Radiol. **37** : 826, 1964.
- 22) **Gabriele, O. F. and Bell, D.** : Radiology **89** : 841, 1967.
- 23) **Lie, T. A.** : *in* Congenital anomalies of the carotid arteries : An angiographic study and a review of the literature. Williams and Wilkins, Baltimore, 1968.
- 24) **Brucher, J.** : Radiology **93** : 51, 1969.
- 25) **Lombardi, G.** : Ophthalmologica **157** : 321, 1969.
- 26) **Picard, L., Vignaud, J., Lombardi, G. and Roland, J.** : Mod. Probl. Ophthal. **14** : 164, 1975.
- 27) **Moret, J., Vignaud, J., Lasjaunias, P. and Doyon, D.** : *in* Advances in cerebral angiography. Springer-Verlag, Berlin, Heiderberg, New York, p331-339, 1975.
- 28) **Lasjaunias, P., Moret, J. and Mink, J.** : Neuroradiology **13** : 215, 1977.
- 29) **Shikuma, M., Kikuchi, H., Furuse, S., Karasawa, J., Sakaki, H., Yamagata, S., Nagata, I., Ito, K., Takahashi, N. and Gyohten, T.** : Rinsho Housha Sen **24** : 183, 1979 (in Japanese).
- 30) **Dilenge, D. and Ascherl, G. F. Jr.** : Amer. J. Neuroradiol. **1** : 45, 1980.
- 31) **Nakagawa, T., Tanabe, S. and Satoh, O.** : Brain and Nerve **34** : 405, 1982 (in Japanese).