

## Hypoglossal Artery, a Rare Abnormal Carotid-Basilar Anastomosis

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*Summary.* The hypoglossal artery represents a very rare congenital carotid-basilar anastomosis, for 23 cases only have been described till now. In the present paper the authors (show) a new observation about it as well as five cases of trigeminal arteries. They refer to the angiographic criteria of LIE and SALTZMAN which permit to establish those arterial anomalies. Though many authors have insisted on the frequency of associated aneurysms and on the occurrence of a meningeal hemorrhage as a factor initiating the angiographic study, these two facts have not been found again here. The five patients they describe didn't either present any trigeminal pain. Considering those six carotid-basilar anastomoses, we can note that they are perfectly well tolerated; being clinically dumb they have been accidentally found (three during a vertebro-basilar insufficiency exploration; and three time when searching for a cerebral expansive lesion).

*L'artere hypoglosse, une anastomose carotido-basilaire anormale rare*

*Résumé.* L'artère hypoglosse représente une anastomose congénitale carotido-basilaire très rare, puisqu'à

ce jour 23 cas seulement en ont été décrits. Les auteurs en rapportent une nouvelle observation ainsi que cinq cas d'artères trigéminalées. A cette occasion, ils rappellent les critères angiographiques de LIE et SALTZMAN permettant de reconnaître ces anomalies artérielles. Alors que de nombreux auteurs ont insisté sur la fréquence d'anévrysmes associés et sur la survenue d'une hémorragie méningée, comme facteur déclenchant l'examen angiographique, ces deux faits n'ont pas été retrouvés ici. De même, aucun des cinq malades ne présentait de névralgies trigéminalées. Si l'on considère ces six anastomoses carotido-basilaires, elles sont parfaitement bien tolérées, muettes cliniquement; elles ont été découvertes, fortuitement, deux fois lors de l'exploration d'une insuffisance vertébro-basilaire et trois fois lors de la recherche d'une lésion expansive cérébrale.

*A. hypoglossica, eine seltene abnormale Carotis-Basilaris-Anastomose*

*Zusammenfassung.* Fall-Bericht eines Patienten mit einer primitiven A. hypoglossica. Es handelt sich dabei um die 24. Veröffentlichung in der Weltliteratur.

Accumulation of angiographic observations allowed a better knowledge of carotid and vertebro-basilar system abnormal anastomosis, which had previously been very rarely studied by the anatomists.

In the present paper, we describe six examples of such anastomoses:

- one case of hypoglossal artery, a very rare anomaly (only 23 angiographically described cases in the literature).
- five cases of trigeminal arteries relatively more frequently observed.

In a review of the literature we find the recent monograph of Lie that constitutes the most complete work and an excellent restatement on these malformations.

The remarkable embryological works of Padgett (1948) (studying the development of the cranial arteries in the human embryo) to which all the authors should refer, permitted all explanation of the constitution of these abnormal anastomoses. In an early stage three arteries are formed from the internal carotid: the trigeminal artery, the acoustic artery and the hypoglossal artery that have a posterior destination (Fig. 1). In a later stage of the development, these three formations evolve, while the vertebral and the posterior communicating arteries are individualized.

The persistence of one among the three vessels creates an anomalous anastomosis between the carotid and vertebro-basilar systems (Fig. 2).

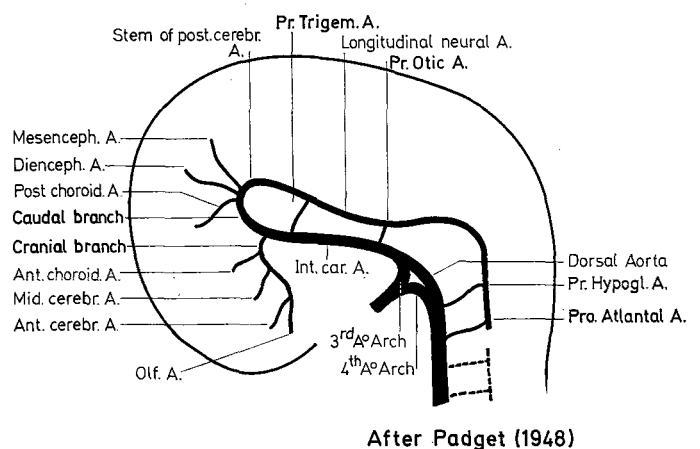


Fig. 1. Disposition of the cranial arteries in the human embryo of 4 mm after Padgett

Concerning our own observations we shall shortly describe the radiological aspect of the trigeminal and

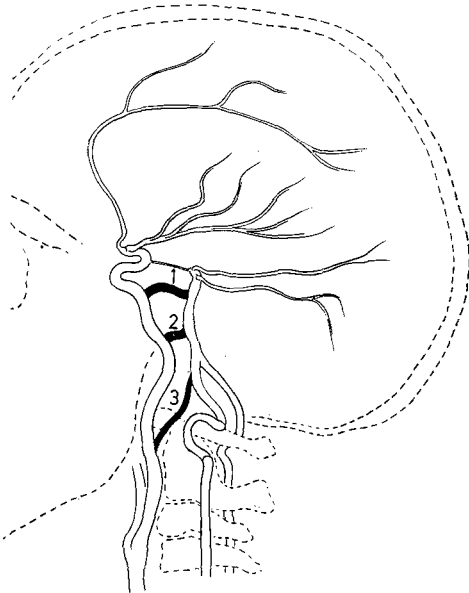


Fig. 2. Disposition of the carotid-vertebro-basilar anastomosis in the adult (after Kraysenbuhl and Yasargil). 1. trigeminal artery. 2. acoustic artery. 3. hypoglossal artery

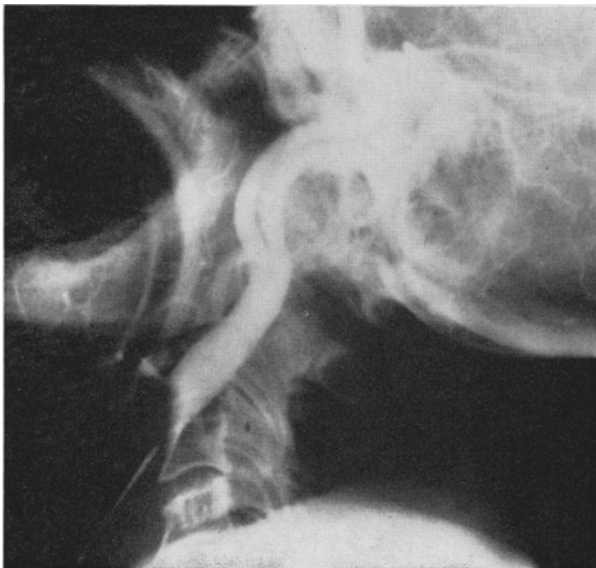


Fig. 3. Puncture of the common carotid showing the internal carotid with its abnormal division. Notice the important caliber of the common carotid and of the internal carotid, which divides, at the level of C2, in two different vessels: the real internal carotid and the hypoglossal artery. The two vessels are juxtaposed and curve symmetrically before penetrating the posterior cranial fossa

hypoglossal arteries. But we did not observe any case of acoustic artery; the few observations in the literature do not correspond to the anatomical and radiological criteria that would enable us to assure their existence (and on which Lie insists), that is why they cannot be taken as available.

Among the clinical symptomatology having been followed by angiographic exploration of published cases of trigeminal arteries, it has chiefly been described by

order frequency: subarachnoidal hemorrhages, facial pain and different motor or sensory transient deficits. The same observation can be made in the twenty cases of hypoglossal arteries counted by Lie.

The concomitant existence of other vascular malformations can also be noticed with a certain frequency. They are often at the origin of the critical clinical pictures leading to cerebral angiography.

Aneurysms may occur on any vessel, and more rarely on the trigeminal artery or the hypoglossal one. Sometimes the associated vertebral hypoplasia is also found in association with trigeminal artery aneurysm, this is the case when there is an hypoglossal artery.

Concerning our own observations; no case of subarachnoidal haemorrhage or associated aneurysm has been noticed in our series; however, in two cases of angiographic exploration for a vertebro-basilar insufficiency syndrome we could not find any vertebral hypoplasia close to the discovered malformation.

In the three other cases, the anomaly was accidentally found while searching for a haematoma or a cerebral abscess. At the end no one among our patients did present trigeminal pain (that would seem to

be a first specific sign, when considering the anatomical relations between abnormal anastomosis and the trigeminal nerve).

### I. The Hypoglossal Artery

The persistence of that artery is quite exceptional. Arising from the internal carotid, between the first and third cervical vertebrae, it corresponds to a divi-

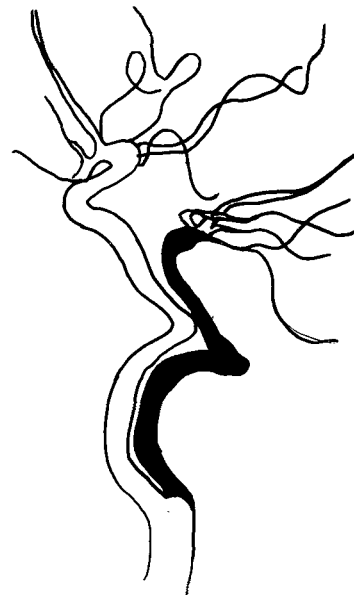


Fig. 4. (Lateral view). The separated vascularization of the two areas is well individualized: the hypoglossal artery filling the posterior cerebral arteries and the cerebellar ones, while the internal carotid normally fills the corresponding cerebral hemisphere territory. A controlateral angiography showed a quite normal vascularization of the internal carotid area.

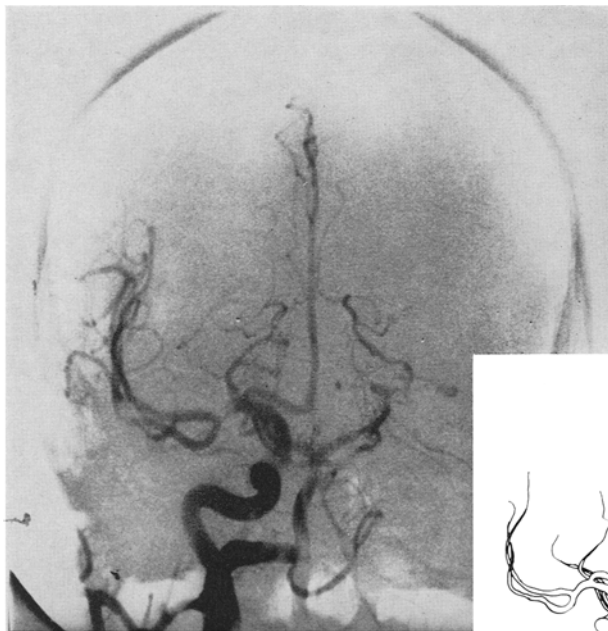


Fig. 5. Same case (Frontal view)

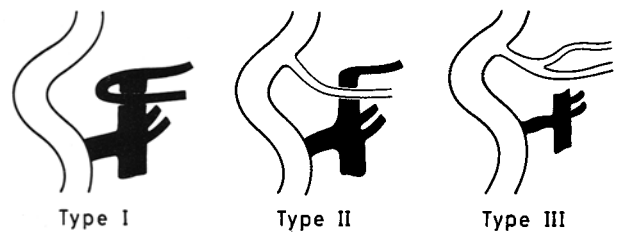


Fig. 6. Three types of trigeminal arteries after Saltzman



sion of that vessel of which it follows the cervical course. Then it goes through the anterior condyloid foramen into the cranium being then very close to the fibres of XIIth cranial nerves. It then goes along the

clivus and reaches the controlateral vertebral artery to constitute the basilar artery.

In view of the rarity of the observations, it is of interest to report our case:

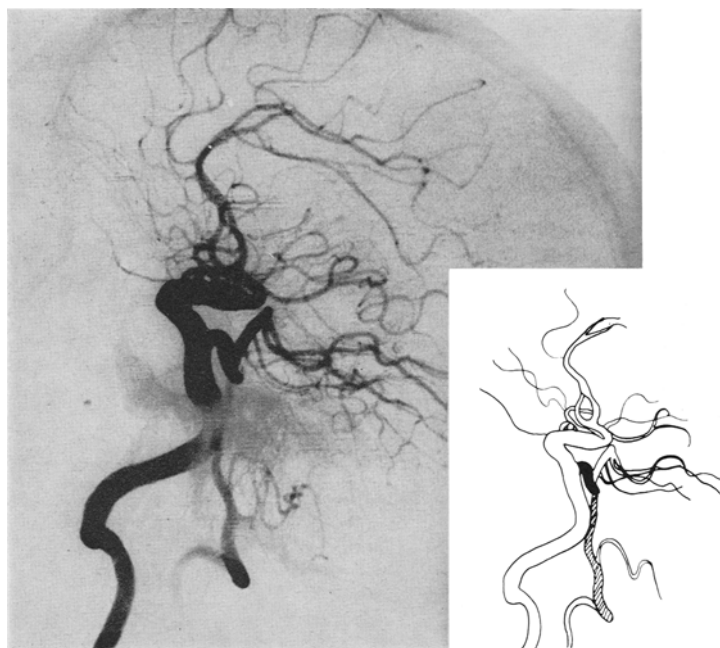


Fig. 7. Trigeminal artery. Type I (lateral view)



Fig. 8. Same case. Arch aortogram shows no hypoplastic vertebral artery

Mrs. Ch..., a 70 years old female was admitted to the department of Neurology under Pr. Serratrice. She went into sudden coma without any sign of clinical

localisation suggesting the presence of an intra-cerebral haemorrhage.

A bilateral carotid angiography was then performed. On the right side, an abnormal carotido-basilar anastomosis by persistence of an hypoglossal artery was found; on the left side, the common carotid did not present any abnormality. A symmetrical hydrocephalus without evidence of intra-hemispheric expanding lesion nor haematoma was found. No anomaly could be found at the level of the posterior cranial fossa vessels opacified via the hypoglossal artery.

The very first evolution was spontaneously favourable, and the patient left hospital. However, the improvement was only transient, as fifteen days later a similar episode obliged her to be readmitted to hospital.

The radiological data of our observation correspond closely to the anatomical description and to the angiographic aspects published in Lie's monograph.

We find again the four criteria proposed by this author:

1. The hypoglossal arises in the cervical region at the level of C5—CIII as a major branch of the internal carotid artery.

2. After a somewhat tortuous course the hypoglossal artery proceeds through the anterior condyloid foramen to the posterior cranial fossa, it does not pass through the foramen magnum.

3. The basilar artery is filled only beyond the point of junction with the anastomosis.

4. The posterior communicating arteries are absent.

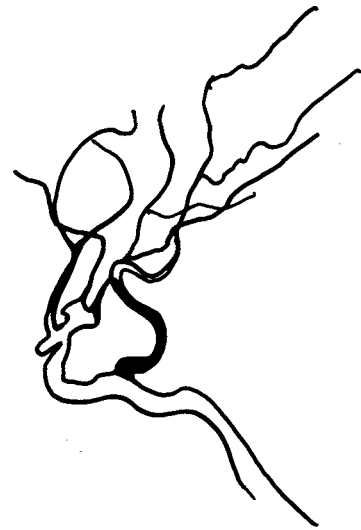


Fig. 9. Trigeminal artery. Type II (lateral view)

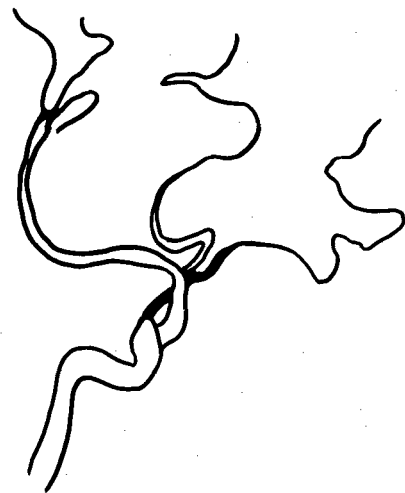


Fig. 10. Same case (frontal view)

## II. The Trigeminal Artery

It arises from the internal carotid in its intracavernous course, it then goes, backwards and ends at the middle third of the basilar artery.

Saltzman describes three types of trigeminal arteries:

— in the type I: there is no posterior communicating artery, the two posterior cerebral arteries are filled

only by the carotid basilar anastomosis (three personal cases).

— in the type II: there is filling of the basilar artery, the superior cerebellar arteries and the posterior cerebral artery on the controlateral side. The homolateral posterior cerebral artery is supplied by the posterior communicating artery (two personal cases).

— in the type III: there is poor filling of the basilar artery and the superior cerebellar arteries. Both the

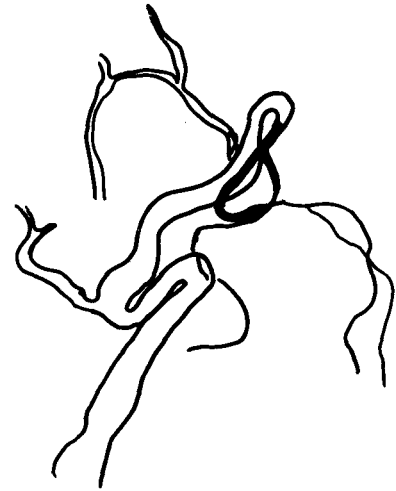
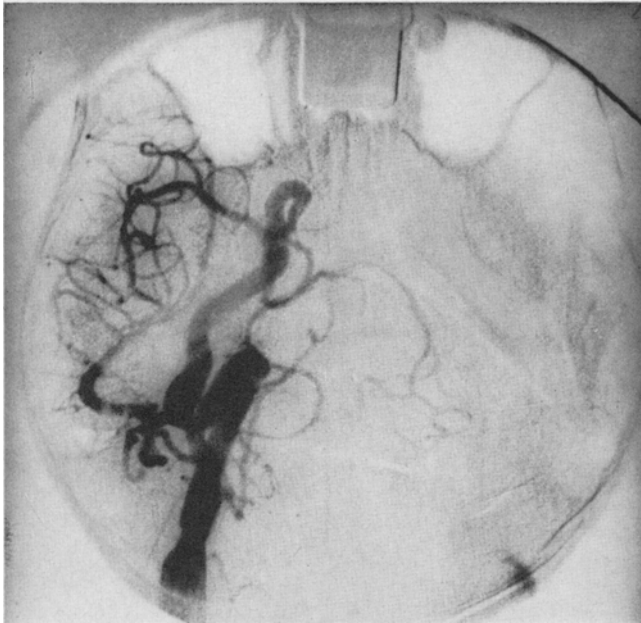


Fig. 11. Same case (Basal view, Hirtz)

posterior cerebral arteries are filled through the posterior communicating artery (we did not observe any case of that type).

That new angiographic observation of the hypoglossal artery is the 24th case published in the world literature, confirming the rarity of that malformation; according to the different authors from 0.025% to 0.26% of angiographies.

In conclusion, we must remember that these two types of abnormal anastomosis (trigeminal or hypoglossal) are practically always accidentally found, as no specific clinical picture is associated with them.

In themselves these anomalies seem to be very well tolerated and they are a purely accidental finding.

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