



## Original Research Article

## Persistent carotico-vertebrobasilar anastomosis: Our experience

Dinesh Jaluka<sup>1</sup>, Manoj Kumar Mahata<sup>1,\*</sup><sup>1</sup>Dept. of Neurosurgery, R G Kar Medical College, Kolkata, West Bengal, India

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## ABSTRACT

**Background:** Persistent carotico-vertebrobasilar arteries are rare kind of primitive anastomoses between carotid and vertebrobasilar system. They may persist after birth or into adult life in some cases.

**Aim:** To appreciate the embryological aspects and associate ourselves with important contributors in this aspect from our clinical practice.

**Materials and Methods:** A retrospective analysis of 87 diagnostic DSA performed since December 2017–May 2018 in cardiac catheterization laboratory.

**Results:** We found persistent carotico-vertebrobasilar arteries in six cases.

**Conclusions:** though persistent carotico-vertebrobasilar anastomoses are rare, sound knowledge and idea should be there to interpret cerebral angiography.

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## 1. Introduction

Various primitive anastomoses occur between the carotid and vertebrobasilar systems during embryonal development, but they rarely persist into adult life.<sup>1–3</sup> These are called pre-segmental arteries and they are named according to the corresponding cranial nerve they accompany. These anastomoses emerge to develop at 4–5 mm embryonic stage, persist for one week and then start regression. The first to disappear is otic artery, followed by hypoglossal artery, trigeminal artery and lastly the pro-atlantal artery. These vessels may persist after birth and also into adult life.

## 2. Aims &amp; Objectives

The purpose of this article is to review the embryology and anatomy of the persistent fetal carotid-vertebrobasilar anastomoses with the emphasis on learning to recognize these on cerebral angiography.

## 3. Materials and Methods

Our study is a retrospective analysis of diagnostic DSA performed since December, 2017–May, 2018 in cardiac catheterization laboratory by trainee endovascular neurosurgeon. A total of 87 diagnostic cerebral DSA performed within that period. A complete clinical and detailed radiological examination were done followed by either conservative or operative management. All patients in this study were enrolled and admitted either directly through the OPD of neurology, neurosurgery or in surgery/medicine wards where they were managed under our guidance.

## 3.1. Statistical data analysis

After collecting all the data, a grand chart was prepared using Microsoft Office Excel 2007 and statistical analysis was performed using SPSS-20 statistical software for analysis of data.

## 4. Observation &amp; Results

We included total 87 patients of spontaneous non traumatic SAH or ischemic CVA in our study.

\* Corresponding author.

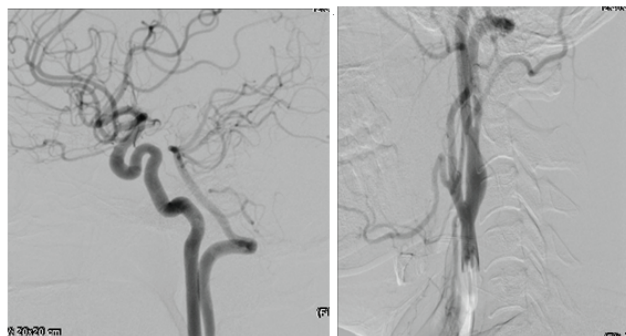
E-mail address: [manojmahata85@gmail.com](mailto:manojmahata85@gmail.com) (M. K. Mahata).

#### 4.1. Demographic profile

Out of the 87 patients, 47(54.02%) were female and 40(45.98%) were male. 50 (57.47%) of them were in the age group of 41-60 years, 23(26.43%) in between 21-39 age group and 12(13.79%) were above 60 yr age group.

#### 4.2. DSA findings

We found persistent trigeminal artery in two cases (2.3%), pro-atlantal artery in three cases (3.44%) and persistent otic artery in one case (1.15%).



**Fig. 1:** Proatlantal artery

### 5. Discussion

D H Padget first described the existence of segmental vessels between anterior and posterior circulation.<sup>4</sup> At the ovulation age of 29 days; i.e, 4-mm embryo stage, the forebrain is supplied by the carotid arteries and the hindbrain is supplied by two parallel longitudinal neural arteries. These two neural arteries fuse to form basilar artery. These two longitudinal arteries are supplied by the carotid arteries via four important anastomoses – trigeminal artery, otic artery, hypoglossal artery and proatlantal artery.

#### 5.1. Persistent trigeminal artery

The reported incidence trigeminal artery is approximately 0.5-0.7%. This artery represents about 85% of carotico-vertebrobasilar anastomoses. It arises from the cavernous segment of internal carotid artery, either posterolateral or posteromedial intracavernous ICA.

There are two types depending on intracavernous course. One has lateral/petrosal course and another one has medial/sphenoidal course. Occasionally it doesn't join the basilar artery and continues as the PICA or one of the cerebellar arteries. These are known as Variant PTA.

Pathological association of this artery to other cerebral conditions like aneurysm, AVM, Moyamoya, Sturge Weber have not been consistently proven. It is however been associated (12-16%) with PHACE syndrome.

#### 5.2. Persistent otic artery

This artery is extremely rare. Primitive otic artery is associated with the otic placode. However, the 8<sup>th</sup> CN remains in the petrous bone and phylogenetic evidence showing dorsal aorta to longitudinal neural artery at this level is lacking. The diagnostic criteria laid down by Lie et al are: POA should arise in lateral portion of petrous canal close to medial turn, should run through the internal auditory meatus and should join basilar artery at a caudal point.

#### 5.3. Persistent hypoglossal artery

This is the second most common type (0.027-0.29%) anastomoses. It arises as a robust branch from posterior side of cervical ICA between C1-C3 segment. It traverses hypoglossal canal to join basilar artery. Lasjaunias presumed that the remnant of the PHA is the ascending pharyngeal artery.

#### 5.4. Proatlantal artery

It originates either from CCA bifurcation, ECA or ICA at C2-C4 level and passes through the foramen magnum.<sup>5</sup> Two variants have been reported

1. Type 1: Arises from posterior ICA – courses between C1 arch & occiput before entering foramen magnum.
2. Type 2: Arises from proximal ECA & traverse between C1-2 interspace to join vertebral artery.

Thus it can be considered as persistent C1-C2 segmental artery.

### 6. Source of Funding

Nil.

### 7. Conflict of Interest

None declared.

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**Author biography**

**Dinesh Jaluka** Assistant Professor

**Manoj Kumar Mahata** Consultant

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