



Fenestrations and Various Duplications of the Posterior Communicating Artery in the Prenatal and Postnatal Periods

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■ **BACKGROUND:** The 2 paired arteries—the posterior communicating arteries (PCoAs) and the precommunicating parts of the posterior cerebral arteries—form the so-called posterior segment of the cerebral arterial circle on the base of the brain. A number of (ab)normal morphologic features were described in the literature (e.g., unusual kinking, or extreme elongations, hypoplasia, duplications, fenestrations, the infundibular widening, or aplasia of the PCoA in the prenatal and/or postnatal periods). The aim of this study was to analyze an incidence of various fenestrations and duplications of the PCoA, and describe their general features and their association with other vascular abnormalities.

■ **METHODS:** The research was performed on the brains of 200 human fetuses and 377 adult cadavers of both genders and different ages using microdissection and macrodissection methods.

■ **RESULTS:** There were 0.34% cases with PCoA fenestrations and 3.12% cases with various PCoA duplications. Their morphologic features were described and compared with the similar PCoA abnormalities recorded in the scientific literature. There was no association between the PCoA and either duplication or aneurysm in adult cases.

■ **CONCLUSIONS:** After thorough examination, the fenestrations and duplications of the PCoA are distinguished as 2 special forms of vascular abnormalities, and the PCoA duplications are characterized as partial and total. Furthermore, whereas the low incidence of a fenestration of the PCoA suggests it to be a sufficiently rare

phenomenon, the duplications of the PCoA trunk are fairly frequent, especially concerning its terminal segment.

INTRODUCTION

In most cases the 2 paired arteries—posterior communicating arteries (PCoAs), as the branches of the cerebral part of the internal carotid arteries (ICAs), and the precommunicating part (P1) of the posterior cerebral arteries (PCAs), which are usually the branches of the basilar artery—form the so-called posterior segment of the cerebral arterial circle on the base of the brain.¹

The PCoAs distribute side branches—the posteromedial central, chiasmatic and hypothalamic branches, as well as the arteries for the tuber cinereum, mammillary bodies, thalamus, and oculomotor nerve.² Their abnormal morphologic features were described in the literature (e.g., an unusual kinking or undulating course,³ extreme elongations,⁴ hypoplasia,^{1,3,5,6} duplication(s),^{3,6-10} triplication(s),¹¹ fenestration(s),^{6,12-15} infundibular widening,^{3,16} or aplasia,^{3,6,8,10,13,17}) in the prenatal and/or postnatal periods.

A fenestration of any cerebral artery was defined as a division of its lumen into distinctly separate channels during the vessel's course, each with its own intima and media tunicae, yet the adventitia may be common.⁸ The fenestration of the PCoA was only recorded at its beginning from the ICA,^{6,12-14} or immediately behind its beginning,^{6,15} as an incidental finding.

The total duplication of the PCoA was described as 2 distinct arteries of separate origin and without distal arterial convergence,⁸ whereas a partial duplication of the PCoA was defined as 2 distinct

Key words

- Abnormalities
- Cerebral arterial circle
- Human brain base
- Posterior communicating artery

Abbreviations and Acronyms

- ICA:** Internal carotid artery
P1: Precommunicating part of the posterior cerebral artery
PCA: Posterior cerebral artery
PCoA: Posterior communicating artery

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Table 1. Cases of Fenestrations and Duplications of the Posterior Communicating Artery (PCoA) in Human Fetuses and Adult Cadavers

Fenestrations of the PCoA	Duplications of the PCoA							Total Duplications
	Partial Duplications							
	Unilateral at the Origin	Unilateral at the Termination	Both the Origin and Termination (independently from the side)	Bilateral at the Origin	Bilateral at the Termination			
	Minor / major	Minor / major					Unilateral	
Schemes of (possible) PCoA Variants and Original Images								
Specimens (n)								
Fetuses ^o								
	1	3	8				18	
	2	4						
		5						

Note: "Undiscovered" PCoA variants are in gray squares; numbers of the cases correspond to the same in the text.

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