

# Variations in the Position and Shape of the Basilar Artery

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## Abstract

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**OBJECTIVE:** Anomalies of vertebrobasilar vessels arise as early embryonal developmental deteriorations. The majority of them concern the position, origin and shape of the basilar artery. Therefore the present study was carried out to find out the variations in position and shape of the basilar artery using Magnetic Resonance Imaging and CT Angiography.

**MATERIAL AND METHODS:** The study included 130 consecutive patients, adults of both sexes, treated in UKC Tuzla. Patients were divided into two groups. In one group (100) were patients without aneurysm in the vertebrobasilar tree, and in the second group (30) patients with aneurysm.

**RESULTS:** Three types of variations in the shape of basilar artery were recorded: those with arched course, S-shaped course, and the straight course type. All the three types are approximately of the same percentage prevalence in the group of subjects without aneurysm in the vertebral-basilar tree, as well as in the group with aneurysm. Basilar artery at 89.33% of respondents was located in medial or in paramedial position.

**CONCLUSION:** Attention is drawn to the practical importance of such variations as a possible source of diagnostic errors during cerebral arteriography. We highlight the morphological aspects of the basilar artery, the knowledge of which would help neurosurgeons safely diagnose, as well as plan and execute vascular bypass and shunting procedures for the treatment of stenosis, aneurysms and arteriovenous malformations.

## Introduction

Anomalies of vertebrobasilar vessels arise as early embryonal developmental deteriorations. The majority of them concern the position, origin and shape of the vertebral and/or basilar arteries. Anatomical variations in the morphology of the basilar artery is thought to be an aetiological factor for many clinic-pathological conditions such as atherosclerosis, infarcts, transient ischaemic attacks and certain syndromes [1].

The basilar artery is formed by the union of the right and left vertebral arteries at the pontomedullary junction (in 67% of cases) [2, 3]. It runs (average length 25-37 mm) over the ventral surface of the pons (ponto-mesencephalic junction) in a shallow median groove and terminates at the upper border of the pons by dividing into the right and left posterior cerebral arteries (PCAs), which pass ventral

to the respective oculomotor nerves [4, 5].

The aim of this study was to find out the variations in position and shape of the basilar artery using Magnetic Resonance Imaging and CT Angiography.

## Material and Methods

The retrospective study involved 130 consecutive patients, adults of both sexes, treated in UKC Tuzla (from IMPAX archive), using Magnetic Resonance Imaging and CT Angiography.

Patients were divided into two groups. One group (100) were patients without aneurysm in the vertebrobasilar tree, and other group (30) patients with aneurysm.

## Results

Three types of variations in the shape of basilar artery were recorded: type with arched course, the letter "S" type, and the straight course type. Basilar artery in the group of patients with aneurysm had arched course in 43.3%, the letter S – shaped was present in 20% of cases, and the straight course in 36.66% of patients (Figures 1, 2 and 3).



Figure 1: Arched course of the basilar artery.

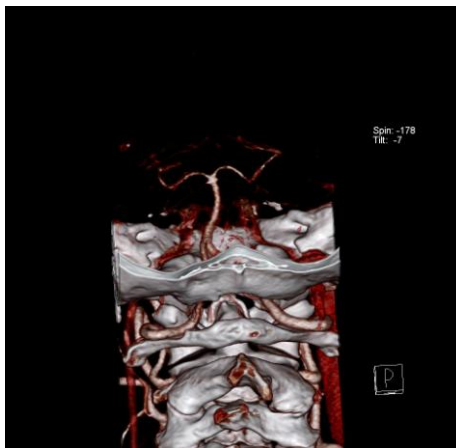


Figure 2: S - shaped basilar artery.



Figure 3: Straight course of the basilar artery.

All aneurysmal enlargements in the group of patients with aneurysm were in the area of the basilar artery at the site of bifurcation in 96% of cases, and only one case (0.33%) on the artery itself (Figure 4).



Figure 4: Aneurysm of the basilar artery.

Basilar artery in the group of patients with no aneurysm with arched course participated in 46.6%, with S-shaped in 23.3%, and with straight course in 30% (Figures 5, 6, and 7).

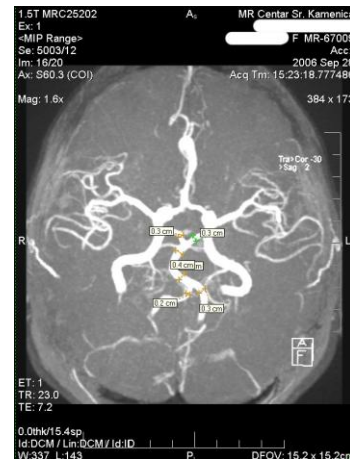


Figure 5: Arched course of the basilar artery.

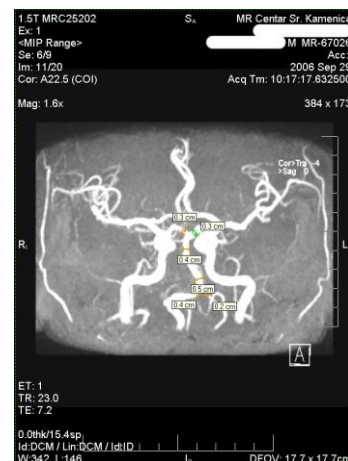


Figure 6: S - shaped basilar artery.



Figure 7: Straight course of the basilar artery.

## Discussion

In medical literature there is no a lot of data on the variation of the position and shape of basilar artery. Basilar artery can have a straight course (9.6%), it can be curved in the shape of the letter "S" (34.6%) or it has arched course (55.8%) [6]. Schulte-Altedorneburg et al (2000) describe the variations in the course of the BA, a subdivision was made into the following 4 configuration types: 1 - straight (curve of 20°), 2 - slightly single-curved (i.e., 20° to 45°), 3 - severely single-curved (i.e., 45°), and 4- S-shaped. Anatomic analysis of the course of the basilar artery revealed that the straight type was the most common configuration (80%); the slightly curved and the severely curved types were present in 5 (11%) and 3 cases (7%), respectively. The S-shaped type was seen in only 1 case. This subdivision considered only lateral deviations of the basilar artery from the midline in an anterior-posterior view, not sagittal deviations [7].

In our study, the distribution of certain types of basilar artery showed slightly different values, especially for straight course of the basilar artery, so in the group of respondents with aneurysm it had arched course in 43.3%, S-shaped was in 20% of cases, and the straight course in 36.66% cases. Percentage prevalence of the basilar artery in the group of subjects without aneurysm with arched course was 46.6%, S-shaped was 23.3%, and with the straight course it was 30%. All the three types were approximately of the same percentage prevalence in the group of subjects without aneurysm in the vertebral-basilar tree, as well as in the group with aneurysm.

In conclusion, attention is drawn to the practical importance of such variations as a possible source of diagnostic errors during cerebral arteriography. We highlight the morphological aspects of the basilar artery, the knowledge of which would help neurosurgeons safely diagnose, as well as plan and execute vascular bypass and shunting

procedures for the treatment of stenosis, aneurysms and arteriovenous malformations.

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