

## Letter to the Editor

### A New Angiographic Finding: Primary Peripheral Slow Flow

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**Received:** 2 July 2020

**Accepted:** 15 September 2020

**DOI:** [10.4274/balkanmedj.galenos.2020.2020.7.30](https://doi.org/10.4274/balkanmedj.galenos.2020.2020.7.30)

**Cite this article as:** Akşit E, Gazi E, Kırılmaz B, Aydın F. A New Angiographic Finding: Primary Peripheral Slow Flow. *Balkan Med J*

#### To the Editor,

In some peripheral angiographies, similar to coronary slow flow phenomenon (CSFP), we observed peripheral slow flow (supplementary video 1). Although slow flow phenomenon following infrapopliteal balloon angioplasty is mentioned in two retrospective studies (1,2), primary peripheral slow flow has been previously reported in only one case report (3). Interestingly, it appears that, similar to CSFP sometimes occurring in a single coronary artery, there is slow flow only in the left lower extremity artery in the video example (video 1). There is also no severe stenosis that would explain this phenomenon. Moreover, considering that peripheral angiography was performed with right femoral artery puncture and that the catheter was within the right femoral artery, it could have been expected for the flow to be slower in the right lower extremity artery with the effect of spasm. However, in this video example, it appears that the flow was slower on the left side, where there was no catheter. Researching the aetiologies that can cause peripheral slow flow can allow us to reach new horizons in both the diagnosis and treatment of peripheral vascular diseases. Possible reasons that may cause peripheral slow flow are presented in Table 1. One of the possible aetiologies that deserve to be researched is May–Thurner syndrome (4). This syndrome is a clinical condition that can occur with iliofemoral thrombosis due to the right common iliac artery compressing the left common iliac vein on the lumbar vertebra. The compression effect in this anatomical variation can be one of the secondary causes of peripheral slow flow. When patients describe claudication, they usually undergo peripheral arterial angiography, and the observation of peripheral slow flow in these patients may spring to mind the underrecognize May–Thurner syndrome (claudication is observed prevalently also among these patients) for differential diagnosis.

The researchers noted that when the infrapopliteal cine frame count (CFC) is greater than 35 (between infrapopliteal artery to ankle joint), it is considered an infrapopliteal slow flow after endovascular intervention. Slow flow after the procedure has been associated with worse wound healing (1,2). In our example, CFC was 297 for the left lower extremity and 129 for the right lower extremity (at 15 frames/s) (between external iliac artery to ankle joint). In this patient, peripheral angiography of both lower extremities was performed via the right femoral artery approach using a 6F pigtail catheter with the same protocol (15/35 = by injecting 15 mL contrast per second, 35 mL contrast in total) and the same automated injection device (Liebel-Flarsheim Company, Cincinnati, OH, USA). The CFC used to detect slow flow in peripheral angiography is more objective than the TIMI frame count (5) used to detect CSFP. Since coronary angiography is performed manually, the flow speed of the opaque medium in the coronary artery varies from operator to operator.

Conversely, peripheral angiographies are performed with an automated injection device under certain standards and protocol, and this provides a more objective evaluation of peripheral slow flow with the CFC method.

Since cardiovascular diseases are the leading cause of mortality and morbidity, research is ongoing to understand these diseases (6). As a new definition, primary peripheral slow flow phenomenon may explain claudication complaints without any other underlying causes when it is detected in the extremity arteries and may explain neurological symptoms without any other underlying causes when it is detected in carotid or vertebral arteries. Having observed both coronary and peripheral slow flow in some patients brings forth the idea that primary slow flow phenomenon may be due to a systemic endothelial dysfunction or microvascular disease in some patients. Since gene mutations are shown in both peripheral slow flow (3) and coronary slow

flow (3,7), recognizing systemic slow flow may lead to genetic studies that will try to reveal new causes of thrombosis predisposition.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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**TABLE 1.** Possible causes of peripheral slow flow phenomenon

Primary causes	Secondary causes
It is associated with local or systemic (together with or without coronary slow flow) endothelial dysfunction or microvascular disease.	Peripheral arterial stenosis Peripheral arterial embolism Peripheral arterial spasm Peripheral arterial ectasia Connective tissue disorders External compression effect (e.g. May–Thurner syndrome) Peripheral arterial interventions