

Bilateral Lower Limb Pain in a Young Female: A Thoraco-Abdominal Culprit: A Case of Takayasu Arteritis (Type III) Presenting with Bilateral Lower Limb Claudication and Extensive Collateral Reformation

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Abstract: Background: Takayasu arteritis (TA) is a rare, large-vessel granulomatous vasculitis predominantly affecting young women. Classic presentation involves upper limb claudication and renovascular hypertension, making isolated bilateral lower limb ischemia an uncommon and diagnostically challenging presentation. Case Summary: We report a young female presenting with bilateral lower limb pain. Doppler ultrasonography revealed biphasic color flow and waveforms in all lower limb arteries bilaterally, prompting CT abdominal and bilateral lower limb angiography. Imaging revealed diffuse circumferential mural thickening of the thoracoabdominal aorta with a critical near-complete luminal compromise at the L1-L2 level (4.1 cm segment), visceral arterial ostial narrowing, and extensive collateral networks via the arc of Riolo and marginal artery of Drummond. The lower limb vasculature was radiologically preserved. Findings were consistent with Takayasu arteritis Type V (Hata et al. angiographic classification). Conclusion: This case highlights the crucial role of CT angiography in unmasking supra-diaphragmatic aortic pathology as the underlying cause of lower limb ischemic symptoms. Early radiological diagnosis with multimodality correlation enables timely intervention and prevents irreversible end-organ damage.

Keywords: Takayasu arteritis; CT angiography; aortoarteritis; bilateral lower limb claudication; arc of Riolo; Hata classification; biphasic Doppler waveform; collateral circulation

1. Introduction

Takayasu arteritis (TA), first described by the Japanese ophthalmologist Mikito Takayasu in 1908, is a chronic idiopathic granulomatous large-vessel vasculitis with a predilection for the aorta and its primary branches. It predominantly affects women in the second and third decades of life and is most prevalent in Asian populations, though it has a global distribution. The incidence is estimated at 1–2 cases per million per year, making it a rare but clinically significant entity.

The classic clinical presentation involves pulselessness, asymmetric blood pressures, upper extremity claudication, carotid artery bruits, and renovascular hypertension. The diagnosis is frequently delayed — sometimes by years — given the insidious onset, non-specific constitutional symptoms in early disease, and the often-indirect nature of ischemic manifestations when robust collateral circulation develops.

Isolated bilateral lower limb claudication as the presenting complaint in TA is uncommon and may mislead the clinician toward peripheral arterial disease or iliac occlusive disease, particularly in younger patients. CT angiography (CTA) provides comprehensive multiplanar vascular assessment, allowing precise characterisation of mural disease activity, luminal compromise, collateral mapping, and Hata classification — all critical for therapeutic planning.

We present a case of a young female who presented with bilateral lower limb pain attributed to critical aortic stenosis from TA, with preserved distal vasculature and robust collateral reformation, detected on CT abdominal and bilateral lower limb angiography.

2. Case Presentation

2.1 Clinical History

A young female in her late twenties presented to the outpatient department with a history of bilateral lower limb pain of several months' duration. The pain was exertional in nature, consistent with claudication, affecting both calves and thighs symmetrically. There was no history of upper limb symptoms, no documented hypertension, no visual disturbance, and no constitutional symptoms such as fever or weight loss. General examination revealed palpable bilateral lower limb pulses with no significant asymmetry in blood pressure between the upper limbs.

2.2 Doppler Ultrasonography Findings

Bilateral lower limb arterial Doppler ultrasonography was performed as the initial vascular investigation. Notably, all evaluated arterial segments— including the common femoral, superficial femoral, popliteal, and tibial arteries — demonstrated biphasic colour flow and spectral waveforms bilaterally, in contrast to the expected normal triphasic pattern. The absence of monophasic waveforms and the

preservation of arterial compressibility made primary lower limb occlusive disease less likely. The biphasic pattern, indicative of increased proximal vascular resistance or a proximal obstructive lesion, prompted further evaluation with CT angiography.

2.3 CT Angiographic Findings

CT abdominal and bilateral lower limb angiography was performed on a multi-detector CT scanner following intravenous iodinated contrast administration. The principal findings are detailed below and summarized in Table 1.

Table 1: Summary of CT angiographic findings. CFA = common femoral artery; SFA = superficial femoral artery; DFA = deep femoral artery; TPT = tibio-peroneal trunk; ATA = anterior tibial artery; PTA = posterior tibial artery; DPA = dorsal pedis artery

Vascular Region	CT Angiographic Findings
Thoracoabdominal Aorta	Diffuse circumferential mural thickening of the visualised lower intrathoracic and entire abdominal aorta; maximum mural thickness 3.7 mm
Critical Aortic Segment (L1–L2)	Short-segment (4.1 cm) non-enhancing concentric mural thickening with near-complete luminal compromise; minimal contrast seen trickling through the severely compromised lumen
Coeliac Trunk	Ostial narrowing secondary to mural thickening; highly attenuated vessel (maximum width 2.8 mm); suboptimal flow with near-optimal reformation of splenic and common hepatic arteries via collaterals
Superior Mesenteric Artery	Ostial narrowing over 3.7 mm length causing 30–40% luminal compromise
Left Renal Artery	Ostial narrowing over 7.6 mm length causing 30–40% luminal compromise
Visceral Collaterals	Arc of Riolo and marginal artery of Drummond — collateral pathways between superior and inferior mesenteric arteries providing reformation
Parietal Collaterals	Multiple collaterals involving anterior chest wall, abdominal wall, and lumbar arteries
Bilateral Iliac Arteries (Common, Internal, External)	Normal course, calibre, and contrast opacification; no thrombosis
Bilateral Lower Limb Arteries (CFA, SFA, DFA, Popliteal, TPT, ATA, PTA, DPA)	Normal course, calibre, and contrast opacification bilaterally; no evidence of thrombosis

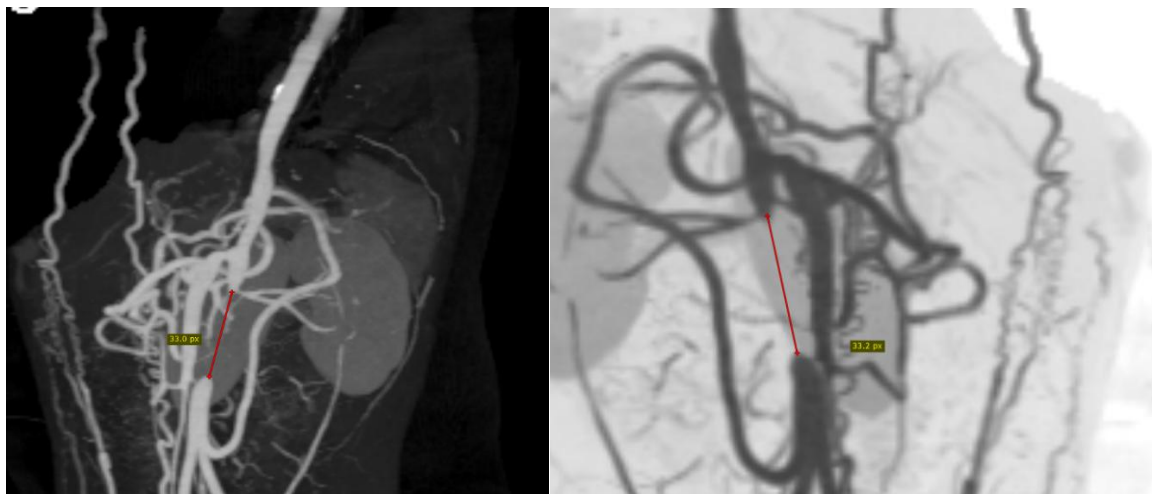


Figure 1 & 2: Reformatted images of CTA showing stenosed aortic segment in sagittal and oblique planes



Figure 3 & 4: Reformatted coronal sections show enlarged Arc of Riolo and Marginal artery of Drummond along with visceral collateral pathways

3. Radiological Diagnosis and Classification

The constellation of imaging findings- diffuse aortic mural thickening, segmental near-complete luminal compromise, multivessel ostial narrowing, and extensive collateral formation- in a young female without evidence of atherosclerosis is diagnostic of Takayasu arteritis.

Using Hata et al.'s angiographic classification system (Table 2), the findings in this patient correspond to Type III. Type III involves the thoracoabdominal aorta and its branches along with the pulmonary arteries, though in this case the pulmonary vasculature was not formally evaluated. The involvement of both the abdominal aorta (Type III pattern) and visceral branches reflects the extensive nature of the arteritic process.

Table 2: Hata et al. angiographic classification of Takayasu arteritis (1996).

Type	Vessel Involvement (Hata et al., 1996)
I	Branches of the aortic arch only
Ia	Ascending aorta, aortic arch and its branches
Ib	Ascending aorta, aortic arch and its branches, thoracic descending aorta
III	Thoracic descending aorta, abdominal aorta, and/or renal arteries (PRESENT CASE)
IV	Abdominal aorta and/or renal arteries only
V*	Combined features of Types Ib and IV — entire aorta and branches

4. Discussion

4.1 Pathophysiology and Vascular Consequences

Takayasu arteritis is characterized by transmural granulomatous inflammation of large vessels, predominantly the aorta and its major branches. The inflammatory cascade leads to intimal proliferation, medial fibrosis, and adventitial thickening, ultimately resulting in luminal stenosis, occlusion, or less commonly, aneurysmal dilatation. The circumferential mural thickening seen in this case- with a non-enhancing inner layer at the zone of critical stenosis- represents the fibroinflammatory rind characteristic of active or burnt-out TA.

4.2 Why Biphasic and Not Monophasic Waveforms?

In normal peripheral arteries, the Doppler spectral waveform is triphasic- a sharp systolic peak, early diastolic reversal, and late diastolic forward flow — reflecting high peripheral resistance in a resting limb. Proximal stenosis of hemodynamic significance results in damping of the waveform. Severe obstruction produces a monophasic, low-resistance pattern. Biphasic waveforms occupy an intermediate zone — systolic peak with loss of the diastolic reversal component — and may represent either moderate proximal stenosis or the hemodynamic effect of substantial collateral recruitment, which reduces effective peripheral resistance.

In this case, the extensive collateral networks (arc of Rioloan, marginal artery of Drummond, lumbar arteries, anterior abdominal wall collaterals) had reconstituted flow distal to the near-complete aortic obstruction. The reconstituted flow,

though adequate to prevent rest ischemia, was dampened and characterized by reduced pulsatility- manifesting as bilateral biphasic waveforms. This explains the preserved but abnormal Doppler findings in morphologically normal-appearing peripheral vessels.

4.3 Collateral Pathways- Anatomical Significance

The arc of Rioloan (meandering mesenteric artery) is a direct anastomotic channel between the middle colic artery (SMA territory) and the left colic artery (IMA territory), running through the transverse mesocolon. The marginal artery of Drummond forms a continuous arcade along the mesenteric border of the colon, providing an alternate collateral route between the same territories. These visceral collaterals represent the body's adaptive response to chronic progressive aortic obstruction and indicate a longstanding disease process.

Additional collaterals via lumbar arteries and the anterior thoracoabdominal wall further augment flow, consistent with the pattern seen in chronic aortic coarctation or Leriche syndrome but in a young female without atherosclerotic risk factors- a combination that should prompt the radiologist to consider inflammatory aortopathy as the primary diagnosis.

4.4 Diagnostic Approach and the Role of CT Angiography

Lower limb Doppler ultrasonography, while an excellent first-line investigation for peripheral arterial disease, has inherent limitations in evaluating the abdominal aorta and its visceral branches. The finding of bilaterally abnormal waveforms without a clear peripheral source mandates proximal evaluation. CT angiography with three-dimensional multiplanar reformatting provides unparalleled assessment of the entire aortovisceral axis, enabling simultaneous evaluation of mural disease, luminal morphology, collateral anatomy, and end-organ perfusion.

The absence of calcified plaques, the smooth circumferential mural pattern, the diffuse rather than segmental distribution, and the young demographic are all features that distinguish TA from atherosclerotic aorto-iliac occlusive disease and other causes of aortic stenosis. HLA-B52 testing, inflammatory markers (ESR, CRP), and clinical correlation with ACR/EULAR criteria are essential adjuncts to radiological diagnosis.

4.5 Therapeutic Implications

Type III TA with near-complete aortic luminal compromise represents a high-risk lesion requiring aggressive immunosuppressive therapy to control active inflammation, followed by vascular intervention (surgical bypass or endovascular stenting) in haemodynamically significant residual stenosis during the quiescent phase. Premature intervention during active disease is associated with higher restenosis rates.

Take Home Message

- Bilateral biphasic Doppler waveforms in lower limb arteries, without focal peripheral stenosis, should prompt evaluation for a proximal aortic obstructive lesion- do not stop at the groin.

- Takayasu arteritis can present with lower limb symptoms as the predominant or sole complaint, particularly when proximal aortic collateral flow has been sufficient to prevent rest ischemia.
 - CT angiography is the modality of choice for comprehensive evaluation of TA- it characterizes mural disease, grades luminal compromise, maps collateral anatomy, and facilitates Hata classification for treatment stratification.
 - Morphologically normal peripheral vasculature on CT or Doppler does not exclude significant proximal obstructive disease; always follow the haemodynamic signal upstream.
 - The arc of Riolo and marginal artery of Drummond are important collateral pathways in aortic obstruction- their identification should prompt the radiologist to search for a proximal cause.
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In a young woman with bilateral claudication and no atherosclerotic risk factors, Takayasu arteritis must be the first differential- and imaging-informed early diagnosis can be life-changing

5. Conclusion

This case underscores a critical radiological lesson: the anatomical site of symptomatic ischemia may be far removed from the actual obstructive lesion. A young female presenting with bilateral lower limb pain and bilaterally unremarkable Doppler waveforms was found to have near-complete aortic obstruction at the L1–L2 level secondary to Takayasu arteritis Type III- with preserved peripheral vasculature maintained by extensive collateral networks.

CT angiography was pivotal in establishing the diagnosis, mapping the disease extent, identifying collateral pathways, and guiding further management. The combination of clinical, Doppler, CT angiographic, and serological data- including HLA-B52 testing- is essential for confirming the diagnosis, initiating appropriate immunosuppressive therapy, and planning timely vascular intervention.

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