International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 11, Issue 01, January 2026,
https://doi.org/10.23958/ijirms/vol11-i01/2161

Case Report

Platypnea - Orthodeoxia Syndrome Caused by a Patent Foramen Ovale Associated with Ascending Aortic Ectasia

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Received: 30 December 2025; Accepted: 20 January 2026; Published: 24 January 2026

Abstract

Platypnea–orthodeoxia syndrome (POS) is a rare and often underdiagnosed condition characterized by dyspnea and arterial desaturation induced by the upright position, with improvement in the supine position. The most common mechanism involves a right-to-left shunt, frequently through a patent foramen ovale (PFO), facilitated by anatomical or functional alterations.

We report the case of a 73-year-old woman admitted with recurrent episodes of exertional dyspnea and severe hypoxemia. Initial investigations, including chest imaging and laboratory tests, were unremarkable. Marked positional hypoxemia was documented by arterial blood gas analysis, with significant improvement in the supine position. Given the clinical suspicion of platypnea–orthodeoxia syndrome, transesophageal echocardiography was performed and revealed a patent foramen ovale with a right-to-left shunt triggered by upright posture and Valsalva maneuver, associated with an atrial septal aneurysm and a horizontally oriented, ectatic ascending aorta. Percutaneous closure of the PFO was successfully performed, resulting in complete resolution of symptoms and normalization of oxygen saturation.

This case highlights the importance of considering platypnea–orthodeoxia syndrome in patients with otherwise unexplained positional hypoxemia. Careful clinical observation and targeted imaging performed in the appropriate posture are essential for diagnosis. Percutaneous closure of the intracardiac shunt can lead to rapid and complete symptom resolution.

Keywords: ***Platypnea–Orthodeoxia Syndrome, Patent Foramen Ovale, Positional Hypoxemia, Right-to-Left Shunt, Ascending Aortic Ectasia.***

Introduction

Platypnea–orthodeoxia syndrome (POS) is a rare and frequently underdiagnosed condition characterized by dyspnea and arterial desaturation that worsen in the upright position and improve in the supine position [1]. Despite being described several decades ago, the terms platypnea and orthodeoxia were originally described in the context of pulmonary vascular disorders and its postural nature often leads to delayed recognition in clinical practice [2,3].

The underlying mechanism of POS is usually a right-to-left shunt, most commonly intracardiac and related to a patent foramen ovale or other interatrial communications. However, the presence of an anatomical defect alone is typically insufficient to cause symptoms. Acquired factors such as ascending aortic elongation or ectasia, atrial septal aneurysm, or thoracic deformities may alter cardiac geometry and promote posture-dependent shunting later in life. Because most diagnostic investigations are routinely performed in the supine position, the diagnosis may easily be missed [4-6].

Early identification of POS is essential, as it represents a potentially reversible cause of severe hypoxemia. We report a case of intracardiac POS associated with a patent foramen ovale, atrial septal aneurysm, and ascending aortic ectasia, successfully treated with percutaneous closure, highlighting the importance of clinical suspicion and postural evaluation.

Case Description

A 73-year-old woman, previously independent in daily activities, was referred to the emergency department due to progressive asthenia and exertional dyspnea lasting approximately one month. She denied fever, cough, orthopnea, lower limb edema, or bleeding. On initial assessment in primary care, peripheral oxygen saturation ranged between 70% and 80%, prompting hospital referral.

On hospital admission, she was conscious, oriented, tachypneic, and centrally cyanotic, requiring high-flow oxygen via a non-rebreather mask. Arterial blood gas analysis revealed severe hypoxemia with respiratory alkalosis. Physical examination showed normal heart sounds without murmurs, clear lung auscultation, and no peripheral edema. Laboratory tests, chest radiography, electrocardiography, and viral respiratory panel were unremarkable.

Her medical history included hypertension, dyslipidemia, osteoporosis with vertebral fractures and secondary kyphoscoliosis, chronic venous insufficiency, a prior hemorrhagic stroke, and a previously documented atrial septal aneurysm without evidence of shunting. She also had prior occupational exposure to wood dust. A computed tomography pulmonary angiography excluded pulmonary embolism but revealed ectasia of the ascending aorta. Subsequent chest computed tomography confirmed ascending aortic ectasia with a horizontalized configuration and mild basal interstitial changes.

During hospitalization, the patient experienced recurrent episodes of dyspnea and hypoxemia triggered by standing or minimal exertion, with rapid improvement upon returning to the supine position. Arterial blood gas analysis performed under identical oxygen supplementation demonstrated marked postural variation, with severe hypoxemia in the seated position and near normalization in the supine position, raising strong suspicion for platypnea–orthodeoxia syndrome (**Table 1**).

Table 1: Arterial blood gas parameters according to body position

Parameter	*Seated position (post-exertion)*	*Supine position*
pO_2 (mmHg)	34.9	121.0
SpO_2 (%)	71.0	97.6

Note: *Arterial blood gas analyses were performed with a 30-minute interval between assessments. Both measurements were obtained under identical oxygen supplementation (4 L/min via nasal cannula).*

Given this clinical pattern, transesophageal echocardiography was performed and demonstrated a patent foramen ovale associated with an atrial septal aneurysm. A significant right-to-left shunt was documented during upright positioning and Valsalva maneuver, confirmed by color Doppler and early passage of agitated saline contrast into the left atrium. The ascending aorta was ectatic and horizontally oriented, contributing to deformation of the atrial septum during verticalization.

Right heart catheterization confirmed the presence of a patent foramen ovale, which was successfully closed percutaneously, with good angiographic and echocardiographic results. Following the procedure, the patient experienced complete resolution of dyspnea and hypoxemia, with stable oxygen saturation in both supine and upright positions. She was discharged five days later without the need for supplemental oxygen and remained asymptomatic on follow-up at 6months and 1year.

Discussion

Platypnea–orthodeoxia syndrome (POS) is an uncommon and frequently overlooked cause of hypoxemia, defined by dyspnea and arterial desaturation that worsen in the upright position and improve in the supine position. POS is frequently misdiagnosed as primary pulmonary disease or heart failure, leading to unnecessary investigations and delayed definitive treatment. The syndrome requires the coexistence of a right-to-left shunt and a functional or anatomical factor that allows posture-dependent redirection of blood flow. Intracardiac shunts account for the majority of reported cases, most commonly through a patent foramen ovale [1,4,6].

Although a patent foramen ovale is relatively common in the adult population, only a small minority of individuals develop platypnea–orthodeoxia syndrome. This observation underscores that an interatrial communication alone is usually insufficient to produce clinically significant shunting. Additional acquired factors are required to modify atrial geometry or intracardiac flow dynamics [4,6,7]. In the present case, the combination of an atrial septal aneurysm, ascending aortic ectasia with horizontalization, and kyphoscoliosis likely acted synergistically to promote posture-dependent right-to-left shunting.

Ascending aortic elongation or ectasia is a well-described precipitating factor in intracardiac POS. Age-related changes in the aorta may cause mechanical distortion of the atrial septum, reduce septal tension, or alter the orientation of venous inflow toward the interatrial septum. These effects are accentuated in the upright position, facilitating shunt opening through a previously silent foramen ovale [6,7]. Increased septal mobility due to an atrial septal aneurysm further predisposes to intermittent shunting without sustained elevation of right atrial pressure [4,6].

The diagnostic challenge of POS lies in its postural nature. The routine performance of diagnostic tests (standard echocardiography and blood gas analysis) exclusively in the supine position represents a major pitfall in the evaluation of positional hypoxemia and may therefore fail to detect the underlying mechanism [1,5]. In this case, the diagnosis was suspected clinically based on reproducible positional hypoxemia and confirmed by contrast transesophageal echocardiography demonstrating early right-to-left shunting in the upright position [4,7].

Once identified, intracardiac platypnea–orthodeoxia syndrome is a potentially curable condition. Percutaneous closure of the patent foramen ovale is currently the preferred therapeutic approach in the absence of contraindications and has been associated with rapid symptom resolution and normalization of oxygenation in most reported cases [8]. The complete and sustained clinical improvement observed in this patient further supports the causal role of the intracardiac shunt and the effectiveness of percutaneous intervention.

Declarations

Ethics approval and consent to participate

Not applicable

List of abbreviations

POS: Platypnea–orthodeoxia syndrome
PFO: Patent foramen ovale

Data Availability

The data analysed for this manuscript is available from the corresponding author on reasonable request.

Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors' contributions

DDR, MNM, LSF and FVG were responsible for patient assessment, clinical data collection, and initial diagnostic workup. All authors contributed to data analysis, literature review, and critical revision of the manuscript. All authors also read, critically revised, and approved the final version of the manuscript.

Acknowledgments

Not applicable

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