

Patent foramen ovale (PFO)

- Venous Air Embolism Following Intraosseous Access: A Case Report and Echocardiographic Findings
 - Outcomes of Patients With Embolic Stroke of Undetermined Source Treated With Antiplatelet Agents or Anticoagulation: A Multicenter Cohort Study
 - Aortic dilation might be a risk factor for early cardiac perforation after interventional closure of patent foramen ovale: a case report
 - Right atrial thrombus and paradoxical embolism risk in a trauma patient with patent foramen ovale: case report
 - Percutaneous closure of patent foramen ovale in patients with platypnea-orthodeoxia syndrome: an Italian multicenter experience
 - Histology of PFO-associated stroke thrombus compared to iliofemoral deep vein thrombus: an explorative study
 - Paradoxical embolism via patent foramen ovale: a rare cause of myocardial infarction in an air traveler
 - Patent Foramen Ovale and Pregnancy: A Case Report and Literature Review
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Is a hole between the left and right atria (upper chambers) of the heart. This hole exists in everyone before birth, but usually closes shortly after being born. PFO is what the hole is called when it fails to close naturally after a baby is born.

In neurosurgery

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 - Histology of PFO-associated stroke thrombus compared to iliofemoral deep vein thrombus: an explorative study
 - Real-World Patent Foramen Ovale Closure in Japan - Results From 1-Year Follow-up of the Amplatzer(TM) PFO Occluder Japan Post-Marketing Surveillance Study
 - Prevalence, Causal Classification, and Prognosis of Patent Foramen Ovale in Young Patients With Embolic Strokes of Undetermined Source
 - Burden of Modifiable Risk Factors in Young-Onset Cryptogenic Ischemic Stroke by High-Risk Patent Foramen Ovale
 - Mechanical Thrombectomy for Acute Medium Vessel Occlusion Because of Paradoxical Cerebral Embolism in a Patient with a Right Aortic Arch: A Case Report
 - Successful recovery of vision following intravenous thrombolysis using low-dose alteplase in central retinal artery occlusion
 - Not just any headache
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Patent foramen ovale (PFO) is a congenital cardiac anomaly that can have implications in neurosurgery, particularly in relation to paradoxical embolism, stroke, and perioperative management. Here are the key aspects of its relevance:

1. Pathophysiology and Clinical Significance in Neurosurgery - Paradoxical Embolism and Stroke: PFO allows venous thrombi or emboli to bypass the pulmonary circulation and enter systemic circulation, potentially causing embolic strokes, particularly in younger patients with cryptogenic strokes. This is a major concern in neurovascular surgery. - **Migraine with Aura:** Some studies suggest an association between PFO and migraines, which can be relevant in patients undergoing neurosurgical evaluation for chronic headaches.

2. PFO and Neurosurgical Procedures - Perioperative Risk: Neurosurgical procedures, especially those requiring prolonged immobilization, increase the risk of venous thromboembolism (VTE). If a PFO is present, the risk of paradoxical embolism leading to perioperative stroke is higher. - **Endovascular Neurosurgery:** In procedures such as carotid stenting, aneurysm coiling, and embolization of arteriovenous malformations (AVMs), a PFO can predispose patients to embolic complications, requiring careful management. - **Intracranial Pressure (ICP) Considerations:** Raised ICP can transiently increase right atrial pressure, which may worsen right-to-left shunting in patients with a PFO, increasing the risk of embolic events.

3. Diagnostic Considerations - Bubble Study with Transcranial Doppler (TCD) or Transesophageal Echocardiography (TEE): These are used to assess right-to-left shunting and evaluate PFO size and significance. - **Magnetic Resonance Imaging (MRI):** Can be helpful in identifying embolic stroke patterns consistent with paradoxical embolism.

4. Management in Neurosurgical Patients - Anticoagulation vs. Closure: In patients with a history of embolic stroke, PFO closure may be considered, especially if they are undergoing neurosurgical interventions that increase embolic risk. - **Perioperative Considerations:** Avoiding prolonged bed rest, using compression devices, and considering prophylactic anticoagulation can help mitigate the risk of paradoxical embolism. - **Anesthesia Considerations:** Avoiding maneuvers that increase right atrial pressure (e.g., excessive PEEP in ventilated patients) may reduce right-to-left shunting.

5. Special Considerations in Specific Neurosurgical Populations - Neurosurgical Trauma Patients: PFO may complicate the management of traumatic brain injury (TBI) due to altered cerebral autoregulation and potential for embolic complications. - **Spinal Surgery Patients:** Prolonged immobilization and intraoperative positioning (e.g., prone position) could contribute to venous stasis, increasing the risk of paradoxical embolism. - **Neurosurgical ICU Patients:** Those requiring prolonged intubation or mechanical ventilation may have increased right atrial pressures, worsening shunting through a PFO.

Conclusion While PFO is often asymptomatic, its presence in neurosurgical patients requires careful evaluation due to the risk of paradoxical embolism, particularly in stroke-prone individuals or those undergoing prolonged procedures. A multidisciplinary approach involving neurology, cardiology, and anesthesia teams is crucial for optimizing outcomes.

Under standardized anesthesia and neurosurgical [protocols](#), patients with a PFO can be operated on safely in the [semisitting position](#) ¹⁾.

The mechanism of brain abscess formation putatively related to PFO should be different from that related to common dental sepsis.

Infectious embolism from a latent or even identifiable focus through the PFO may be an underrecognized cause of brain abscess, in contrast to simple seeding of the brain via transit of the

infecting bacteria through the valveless [emissary veins](#) ²⁾.

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Feigl GC, Decker K, Wurms M, Krischek B, Ritz R, Unertl K, Tatagiba M. Neurosurgical procedures in the semisitting position: evaluation of the risk of paradoxical venous air embolism in patients with a patent foramen ovale. World Neurosurg. 2014 Jan;81(1):159-64. doi: 10.1016/j.wneu.2013.01.003. Epub 2013 Jan 4. PubMed PMID: 23295634.

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Last update: **2025/02/18 08:02**

