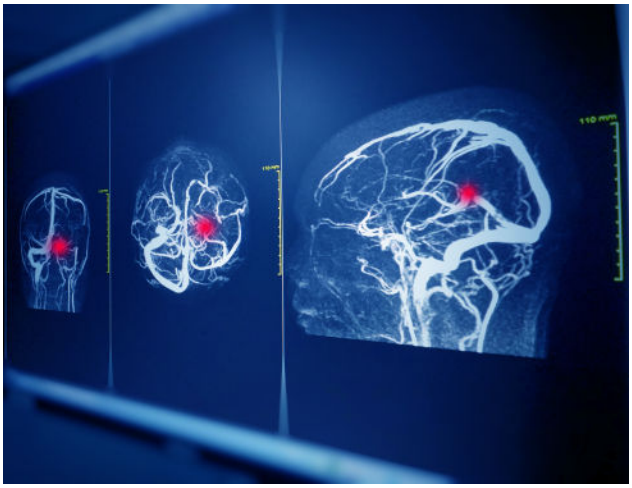
Pulsatile, Venous and Structural Tinnitus 2025

A distinct tinnitus subtype with high diagnostic yield and consistently treatable mechanisms

A total of 55 publications were grouped under the pulsatile, venous and structural tinnitus theme. These studies examined vascular and bony anomalies of the temporal bone and skull base, their haemodynamic consequences, diagnostic pathways and outcomes of endovascular or surgical intervention. Their conclusions converge on a clear message. Pulsatile and structurally mediated tinnitus forms a distinct clinical subtype in which careful anatomical assessment frequently reveals a correctable underlying lesion.

Venous sinus wall anomalies and stenosis

A large proportion of studies focused on sigmoid sinus and transverse sinus pathology. Case series and cohort data for sigmoid sinus wall dehiscence, sigmoid sinus diverticulum and transverse sigmoid junction stenosis consistently linked these lesions with unilateral, pulse synchronous tinnitus. Surgical reconstruction or resurfacing of the sigmoid sinus wall and venous sinus stenting were repeatedly associated with substantial or complete symptom resolution.



High resolution CT and four dimensional flow MRI demonstrated normalisation of venous flow after treatment. Authors concluded that the disappearance of turbulent jets and restoration of more laminar venous circulation closely paralleled tinnitus relief, offering strong mechanistic evidence for the role of abnormal venous haemodynamics.

Long term outcomes of stenting and reconstruction

Long term observational work concluded that venous sinus stenting provides durable tinnitus relief in most well selected patients with venous sinus stenosis and pulse synchronous tinnitus, with relatively low complication rates. Reports of sigmoid sinus wall reconstruction described similar patterns. Reduction of pressure gradients, elimination of focal flow acceleration and restoration of smooth flow were consistently aligned with symptom improvement.

Dural arteriovenous fistulas and vascular shunts

A major subgroup of publications examined dural arteriovenous fistulas and other vascular shunts. These lesions frequently presented with pulsatile tinnitus as the primary or only symptom. Case series described fistulas involving the sigmoid sinus, transverse sinus, superior petrosal sinus and diploic veins. Authors emphasised that these shunts can mimic more benign sinus wall anomalies, making careful angiographic assessment essential.

Endovascular embolisation was typically associated with abolition or marked reduction of tinnitus when complete occlusion was achieved. Some reports highlighted rare presentations, such as postpartum cases or paradoxical contralateral symptoms, reinforcing the importance of broad diagnostic consideration.

Rare vascular and structural causes

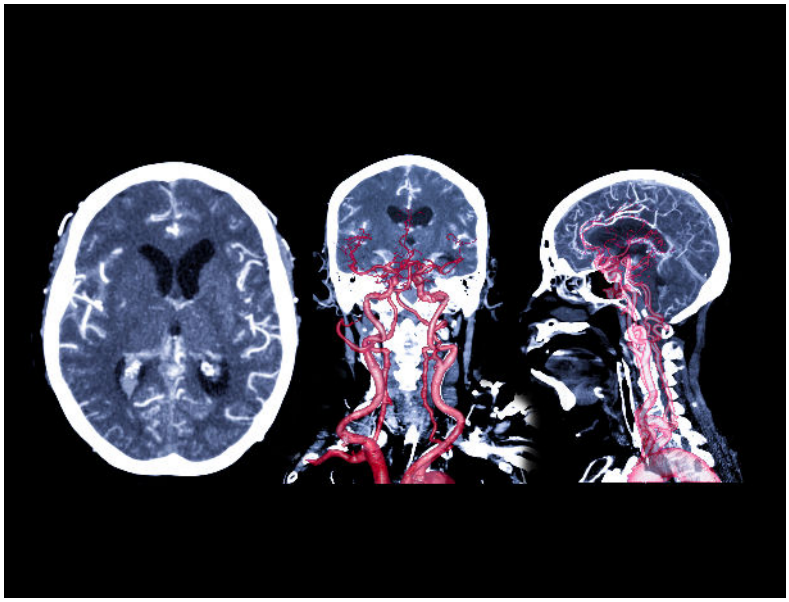
Another set of reports described rare vascular or structural lesions presenting with new onset pulsatile tinnitus. These included ascending pharyngeal artery to internal jugular vein fistulas after trauma, internal carotid artery dissection, diploic arteriovenous fistulas and radiation induced carotid stenosis. Targeted endovascular repair or stenting usually resulted in rapid and often complete symptom resolution.
Mass lesions compressing venous structures, such as tentorial meningiomas, sellar masses and vestibular schwannomas, were also identified. Surgical or radiosurgical treatment that restored venous outflow was commonly followed by improvement or disappearance of tinnitus.

Superior semicircular canal dehiscence and jugular bulb variants

Several studies investigated superior semicircular canal dehiscence and high jugular bulb variants. Findings indicated that these anomalies can independently produce pulsatile tinnitus or interact with venous sinus pathology to create complex auditory and vestibular symptoms. Combined surgical approaches were sometimes required. Jugular bulb diverticula and high jugular bulbs were repeatedly linked with turbulent flow near the middle or inner ear. Surgical resurfacing or endovascular embolisation often produced significant improvement.

Diagnostic imaging and structured evaluation

Imaging strategy was a major theme. Systematic reviews and expert consensus papers concluded that structured diagnostic algorithms improve yield and reduce unnecessary investigations. Computed tomography angiography, magnetic resonance angiography, high resolution temporal bone CT and time resolved MR angiography were consistently recommended as first line tests. Catheter angiography was reserved for suspected shunts or inconclusive non invasive imaging.



Studies of adjunctive diagnostic tools reported that ambient pressure tympanography can capture pulse synchronous middle ear pressure fluctuations. Objective sound recordings from the ear canal helped confirm vascular sources in selected patients. Research on spontaneous otoacoustic emissions and high resolution CT suggested possible roles in screening for sinus wall abnormalities in narrow clinical contexts.

Prognostic factors and clinical workflow

Several studies identified predictors of symptom persistence. In idiopathic intracranial hypertension, pulsatile tinnitus sometimes persisted despite resolution of papilloedema, and the number or severity of venous abnormalities on imaging predicted tinnitus presence. Other studies proposed that interactions among intracranial pressure, venous flow dynamics and sinus wall compliance contribute to symptom behaviour. Workflow analyses emphasised that pulsatile tinnitus should be separated early from non pulsatile forms because the likelihood of a structural or vascular cause is high. Timely referral to centres with expertise in neurovascular imaging and intervention increases diagnostic accuracy and improves access to definitive treatment. Given the intrusive rhythmic nature of symptoms, studies consistently reported major improvements in quality of life when the underlying lesion was identified and treated.

Overall interpretation

The 55 studies within this theme collectively describe pulsatile, venous and structural tinnitus as a highly diagnosable and frequently correctable subtype. Sinus wall defects, venous stenosis, arteriovenous shunts, rare vascular lesions and specific anatomical variants each represent treatable conditions. Endovascular and surgical interventions regularly achieve high rates of substantial or complete symptom resolution when guided by structured imaging and precise anatomical mapping.

Key New Pulsatile and Structural Tinnitus Learnings 2025

VENOUS SINUS PATHOLOGY IS HIGHLY TREATABLE

Sigmoid and transverse sinus wall defects and stenoses are now recognised as common drivers of unilateral pulsatile tinnitus, and repair or stenting often brings near total relief.

"New insight: venous sinus tinnitus has shifted from a diagnostic mystery to a mechanically explainable and usually correctable vascular disorder."

Key New Pulsatile and Structural Tinnitus Learnings 2025 (*continued*)

4D FLOW IMAGING MATCHES SYMPTOMS

Abnormal jets and pressure gradients disappear after treatment.

"New insight: tinnitus improvement aligns directly with haemodynamic normalisation."

PULSATILE TINNITUS AS EARLY VASCULAR ALERT

Some carotid and radiation-related disorders first manifest as tinnitus.

"New insight: pulsatile tinnitus can signal serious disease before deficits emerge."

STRUCTURED IMAGING IMPROVES DIAGNOSIS

Standardised pathways sharply raise diagnostic yield.

"New insight: workflow inconsistency, not technology, is the main barrier."

DAVFS AND SHUNTS ARE UNDER-DETECTED

These lesions frequently present with isolated tinnitus rather than broader signs.

"New insight: mild presentations can mask significant vascular pathology."

HIGH JUGULAR BULBS ARE A DISTINCT GROUP

Variants near the otic capsule can generate tinnitus alone or with other anomalies.

"New insight: small combined abnormalities require detailed temporal bone imaging."

CURE IS NOW REALISTIC

Targeted stenting, reconstruction, embolisation or surgery often eliminate symptoms when the lesion is precisely mapped.

"New insight: long-term resolution is now achievable for many pulsatile cases."