

Posterior fossa anomalies

Chiari I · Chiari II · Dandy–Walker · Joubert syndrome

Morphology, anatomical reasoning, and clinicopathological associations

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Learning objectives

- Localize abnormalities of the cerebellar tonsils, vermis, brainstem, and fourth ventricle.
- Distinguish Chiari I, Chiari II, Dandy–Walker malformation, and Joubert syndrome.
- Connect morphology with hydrocephalus, myelomeningocele, and syringomyelia.
- Interpret characteristic anatomical patterns without conflating them.

Anatomical schematic — not diagnostic imaging

Chiari I

Low tonsils

Chiari II

Small fossa; Descended
vermis

Dandy–Walker

Expanded 4th-ventricular cyst

Joubert

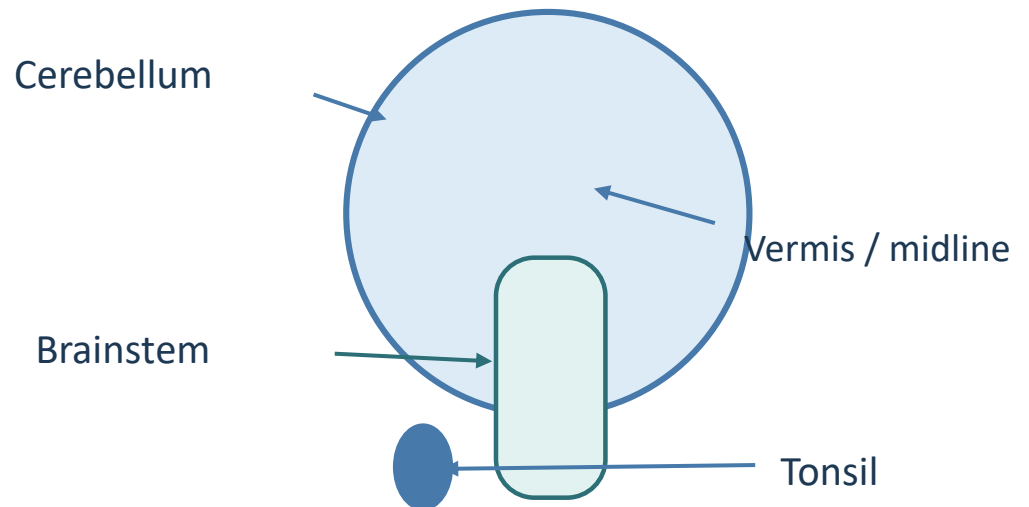
Molar tooth configuration

Four anatomical signatures organize the lecture.

Posterior fossa malformations primarily involve two regions

- The cerebellum may exhibit marked alterations of size, shape, or position.
- Brainstem configuration may be distorted together with cerebellar structures.
- Associated abnormalities can extend beyond the posterior fossa.

Anatomical schematic — not diagnostic imaging

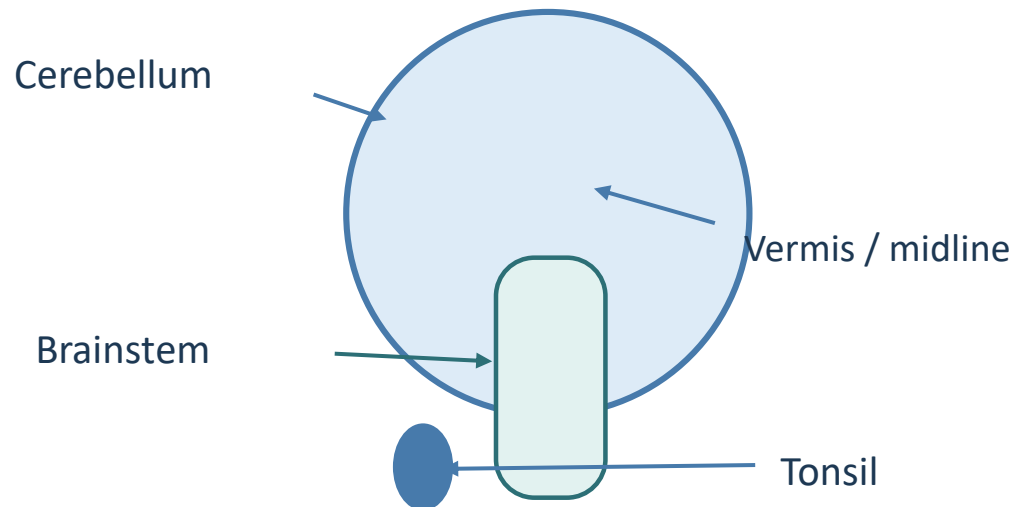


Anatomical location directs morphologic interpretation.

The main anatomical landmarks are not interchangeable

- Cerebellar tonsils: Inferior cerebellar structures relevant to Chiari I.
- Vermis: Midline cerebellar structure altered in Chiari II, Dandy–Walker, and Joubert.
- Superior cerebellar peduncles: Part of the Joubert imaging pattern.

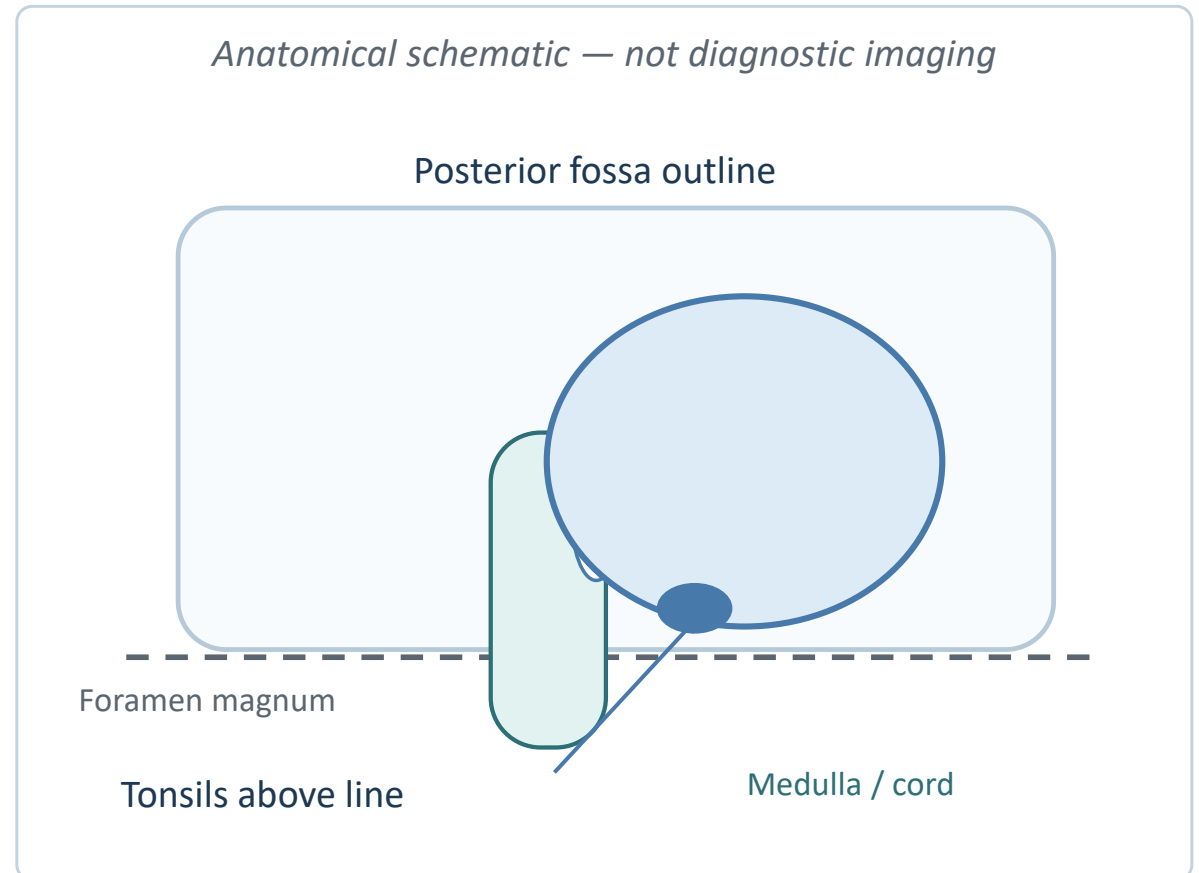
Anatomical schematic — not diagnostic imaging



Name the involved structure before naming the malformation.

The foramen magnum is a major anatomical boundary

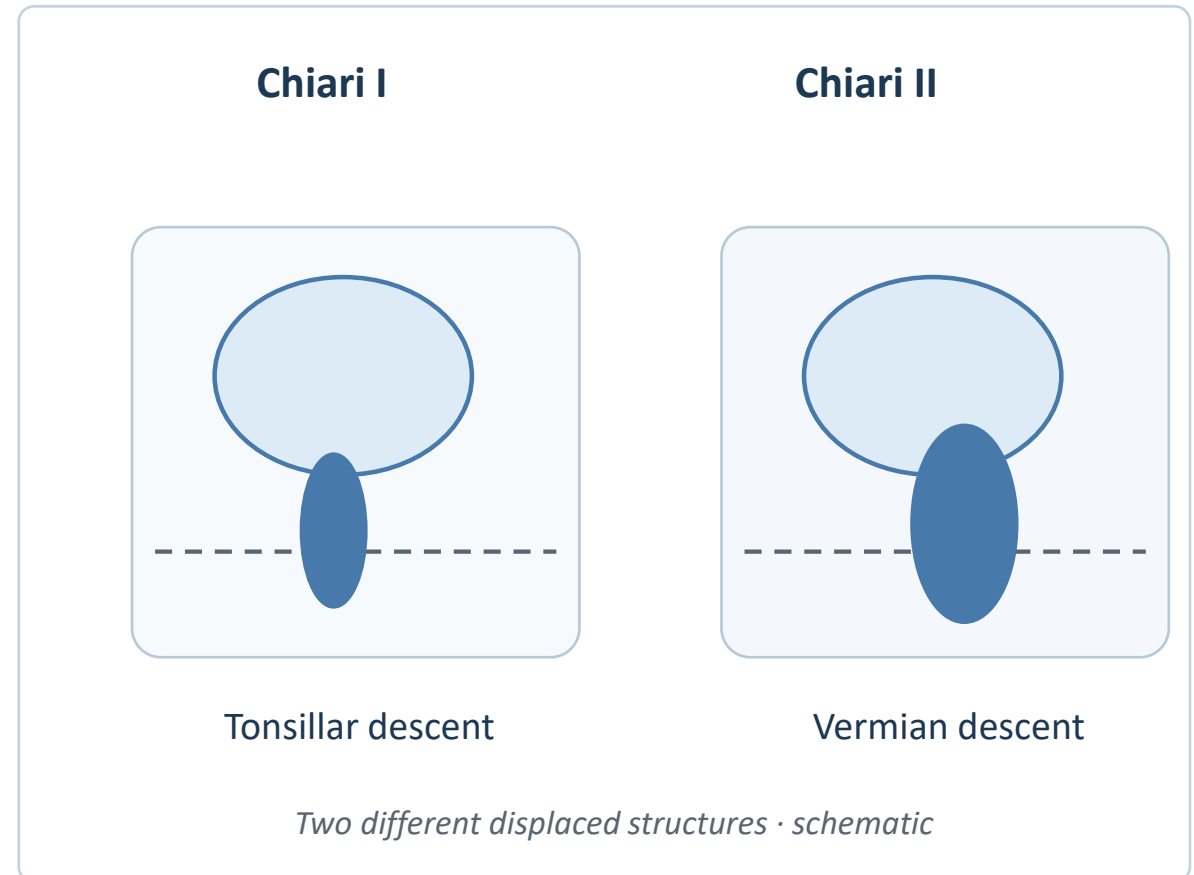
- Inferior cerebellar structures normally remain above the craniocervical junction.
- Descent through the foramen magnum is integral to both Chiari patterns.
- The structure that descends differs between Chiari I and II.



Location relative to the foramen magnum matters.

Tonsils and vermis: Two distinct anatomical signatures

- Chiari I is defined by low-lying cerebellar tonsils.
- Chiari II includes a misshapen midline cerebellum and downward vermian extension.
- Equating the two forms with generic “cerebellar descent” loses specificity.

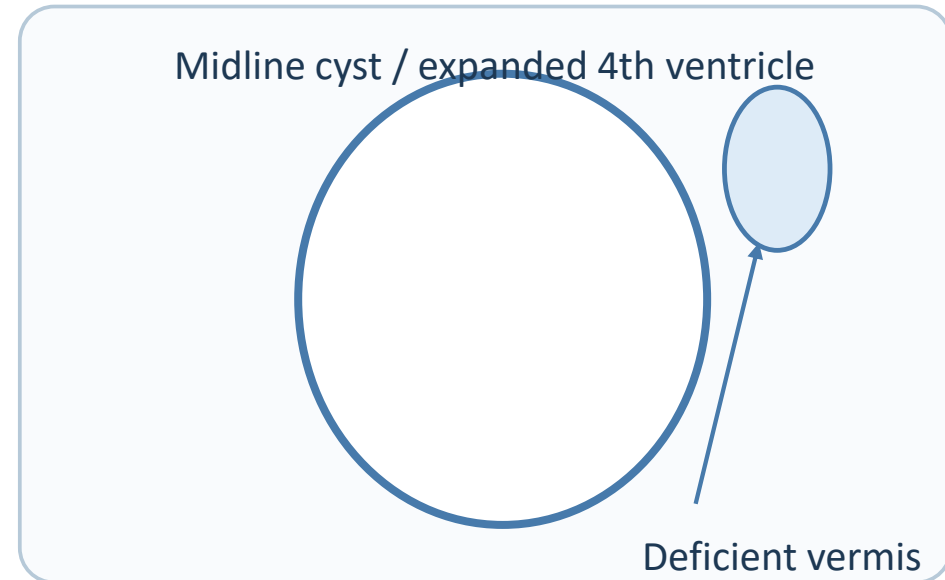


Tonsillar descent $\neq$ vermian displacement.

The fourth ventricle is central to Dandy–Walker morphology

- Dandy–Walker cystic enlargement represents the expanded, roofless fourth ventricle.
- Loss or severe deficiency of the normal vermis allows the large midline cystic space.
- This is anatomically distinct from cerebellar tissue passing through the foramen magnum.

Anatomical schematic — not diagnostic imaging



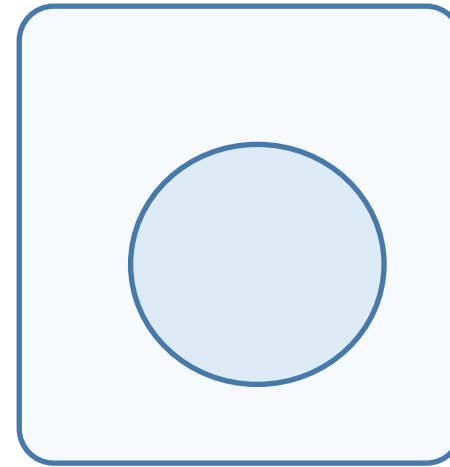
Schematic; Not a specimen image

The Dandy–Walker cyst is a fourth-ventricular malformation.

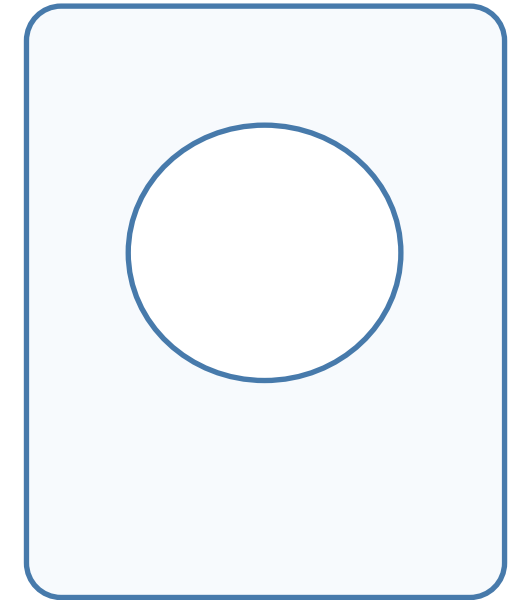
Posterior fossa size separates two major patterns

- Chiari II is associated with a small posterior fossa.
- Dandy–Walker malformation is characterized by an enlarged posterior fossa.
- Size and direction of distortion should be assessed together.

Anatomical schematic — not diagnostic imaging



Small posterior fossa



Enlarged posterior fossa

Small and enlarged posterior fossae imply different patterns.

Four disorders: Four leading morphological clues

- Chiari I → low-lying cerebellar tonsils.
- Chiari II → small fossa with caudally displaced, misshapen vermis.
- Dandy–Walker → enlarged fossa and large midline fourth-ventricular cyst.
- Joubert → vermian hypoplasia and the molar tooth configuration.

Anatomical schematic — not diagnostic imaging

Chiari I

Low tonsils

Chiari II

Small fossa; Descended
vermis

Dandy–Walker

Expanded 4th-ventricular cyst

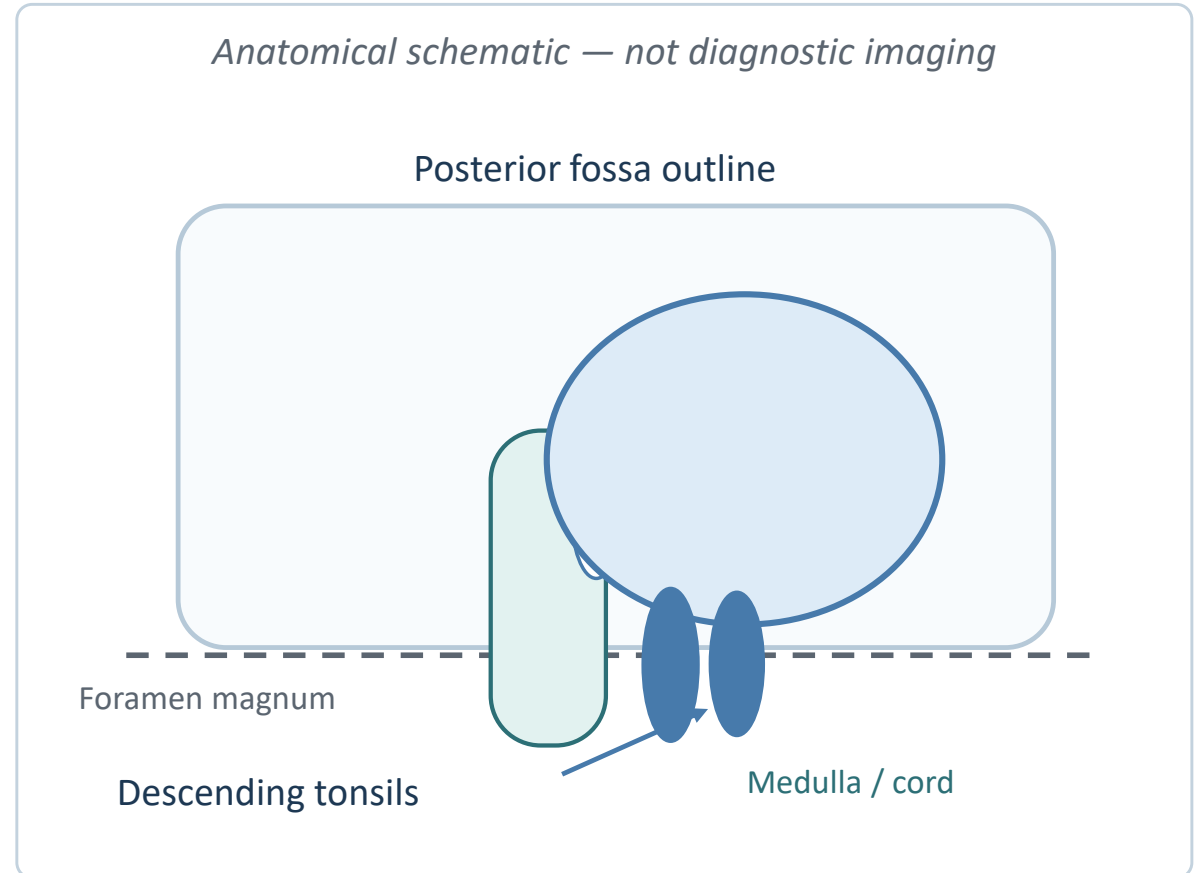
Joubert

Molar tooth configuration

Use an anatomical rather than purely eponymic classification.

Chiari I: The defining lesion is tonsillar descent

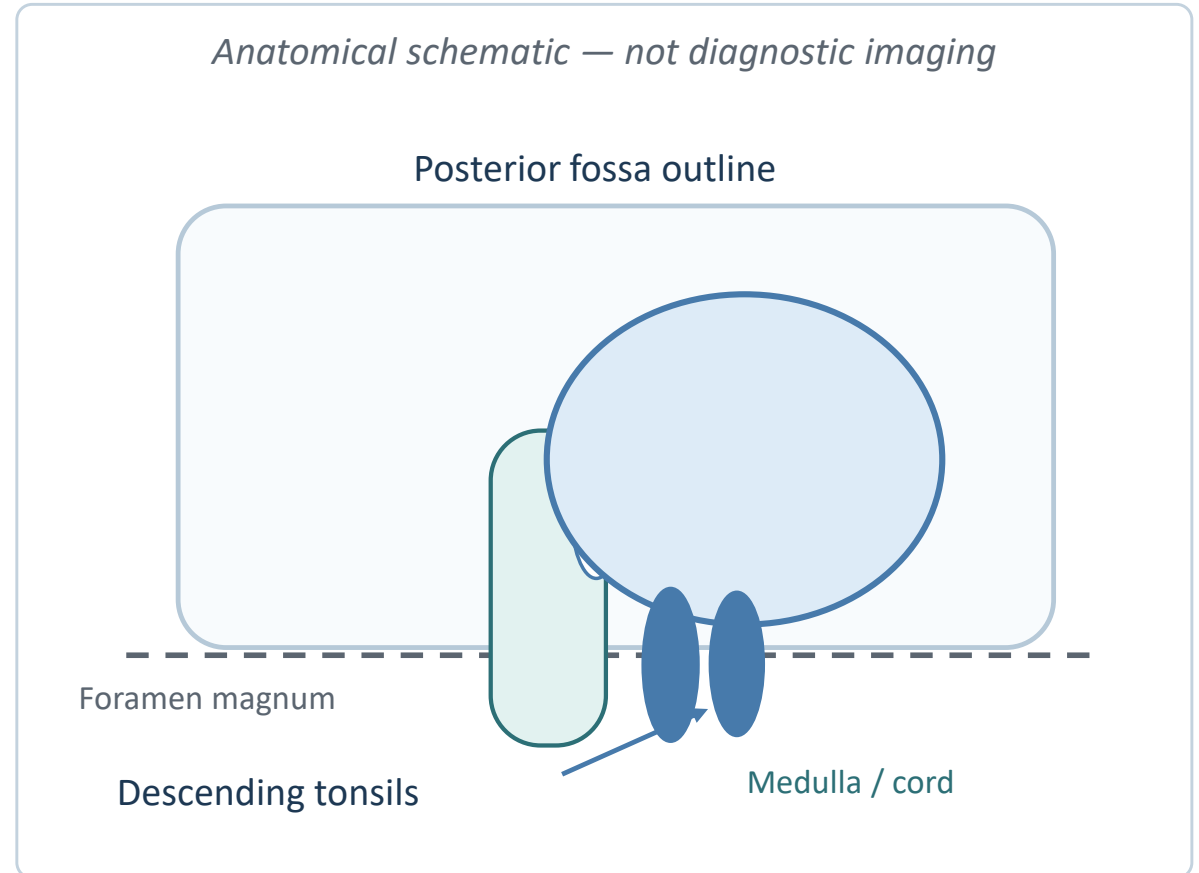
- Cerebellar tonsils lie abnormally low.
- They extend below the foramen magnum into the vertebral canal.
- The description does not require the complex Chiari II-associated constellation.



Structural definition: Low tonsils extending into the spinal canal.

Chiari I: Sagittal pattern

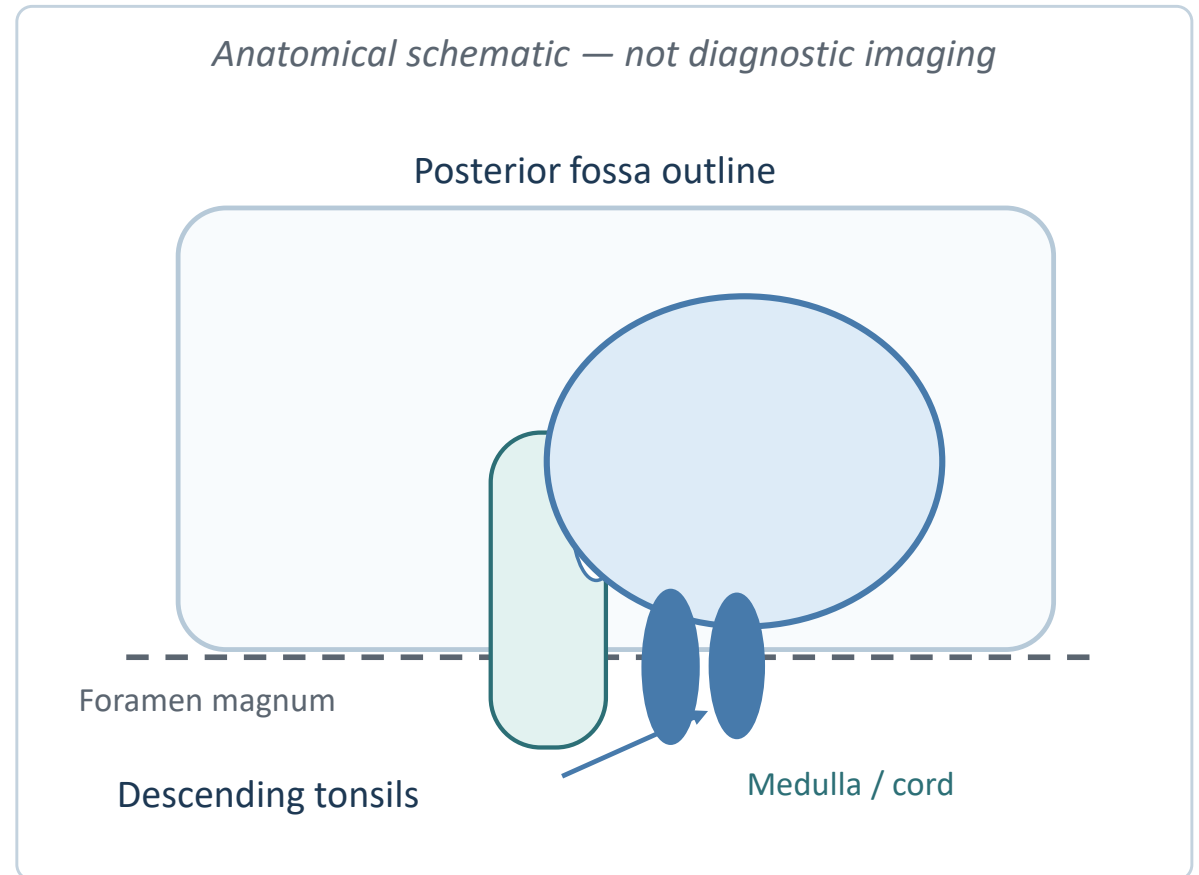
- Identify the foramen magnum as the reference line.
- Follow inferior cerebellar tissue across this boundary.
- The tonsils, not the vermis, are the key named structure.



Schematic: Descent of the cerebellar tonsils.

Tonsillar position creates craniocervical crowding

- Inferior tonsillar extension places cerebellar tissue at the narrow outlet of the skull.
- This positional abnormality is the morphological substrate for local complications.
- The extent of symptoms is not specified by morphology alone.



Anatomic crowding helps explain variable manifestations.

Chiari I can impair cerebrospinal fluid flow

- The source identifies impaired CSF flow as one route to symptoms.
- The abnormality is situated at the skull–vertebral junction.
- Flow disturbance provides a link to spinal cord fluid cavities.

Anatomical schematic — not diagnostic imaging

Tonsils extend low



Craniocervical CSF flow affected

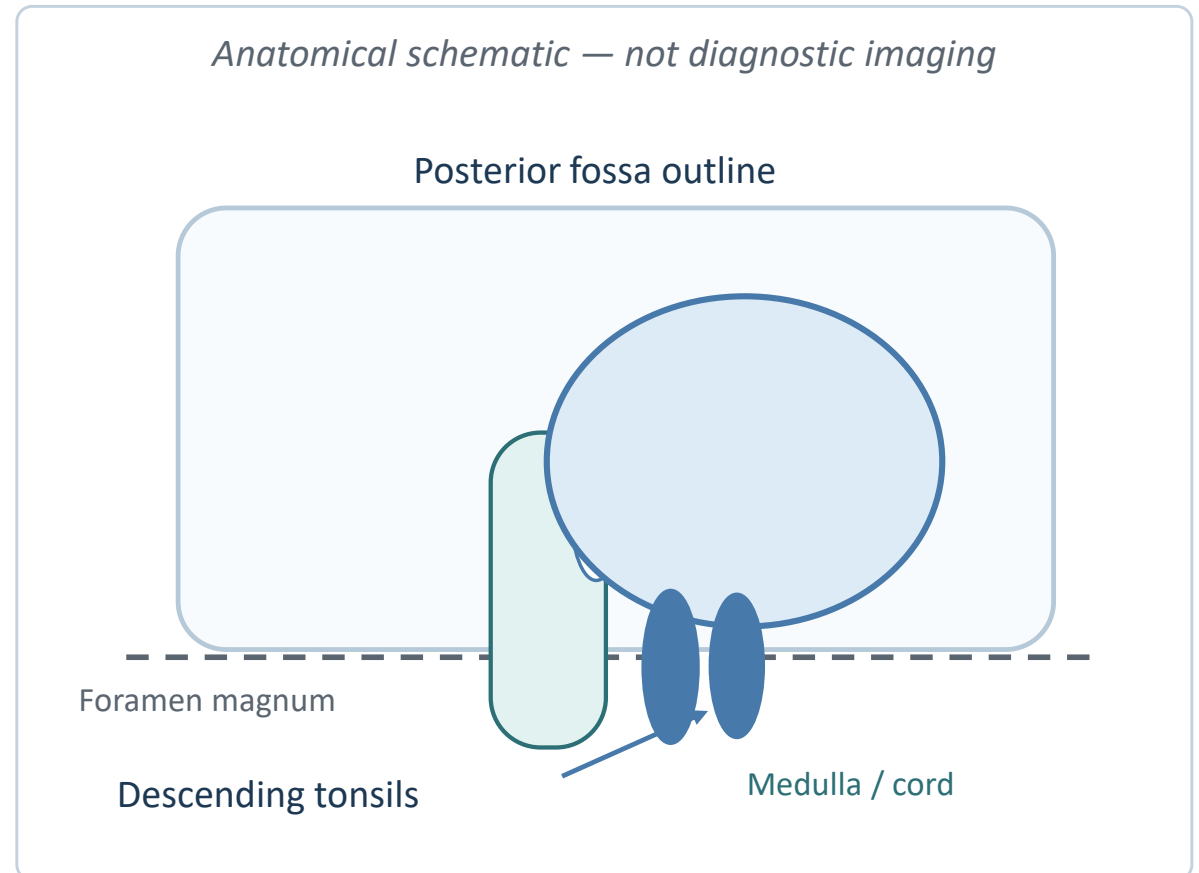


Possible symptoms / syrinx

Inferior displacement may disrupt CSF movement.

Chiari I can produce medullary compression

- The medulla passes through the craniocervical region.
- Low cerebellar structures may compress adjacent medullary tissue.
- Medullary compression is a distinct proposed mechanism of symptoms.

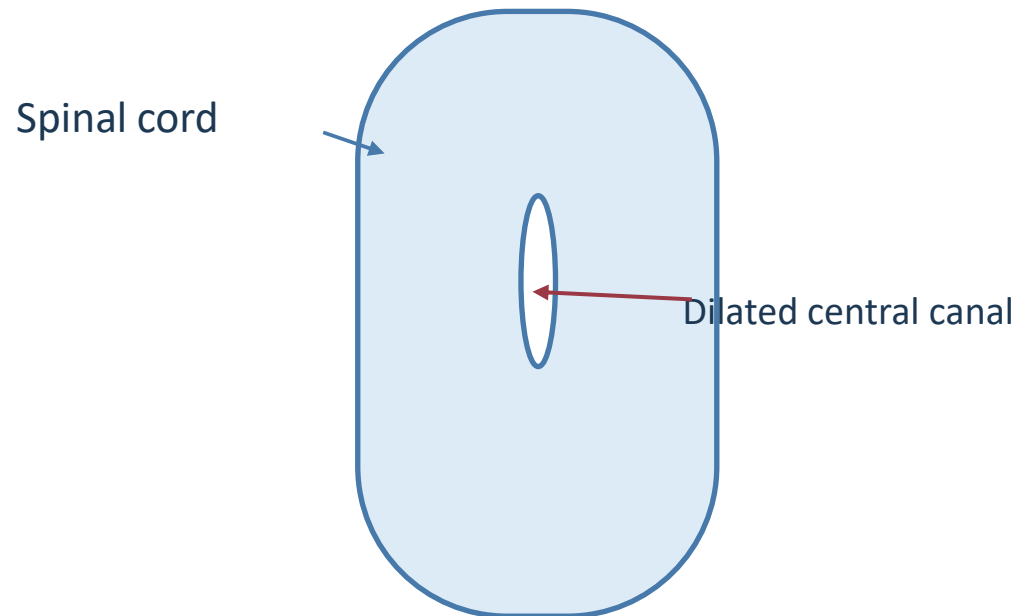


The clinical effect is not limited to a cerebellar abnormality.

Chiari I may coexist with a spinal cord cavity

- Hydromyelia involves an expanded central canal.
- Syringomyelia involves a fluid-filled cavity within spinal cord substance.
- Either as an associated finding in Chiari I.

Anatomical schematic — not diagnostic imaging

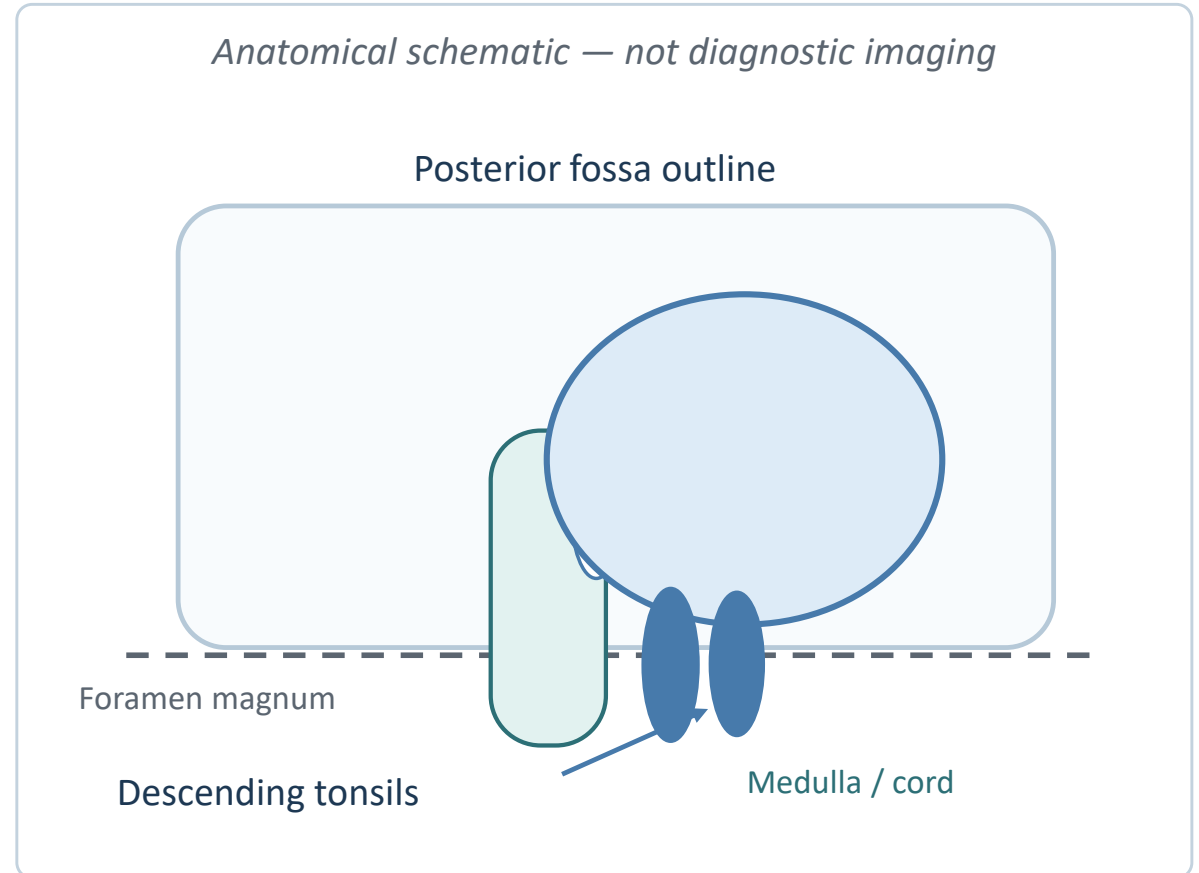


Cord cross-section — schematic

The spinal cord must be considered in a posterior fossa lesion.

Chiari I has a variable clinical expression

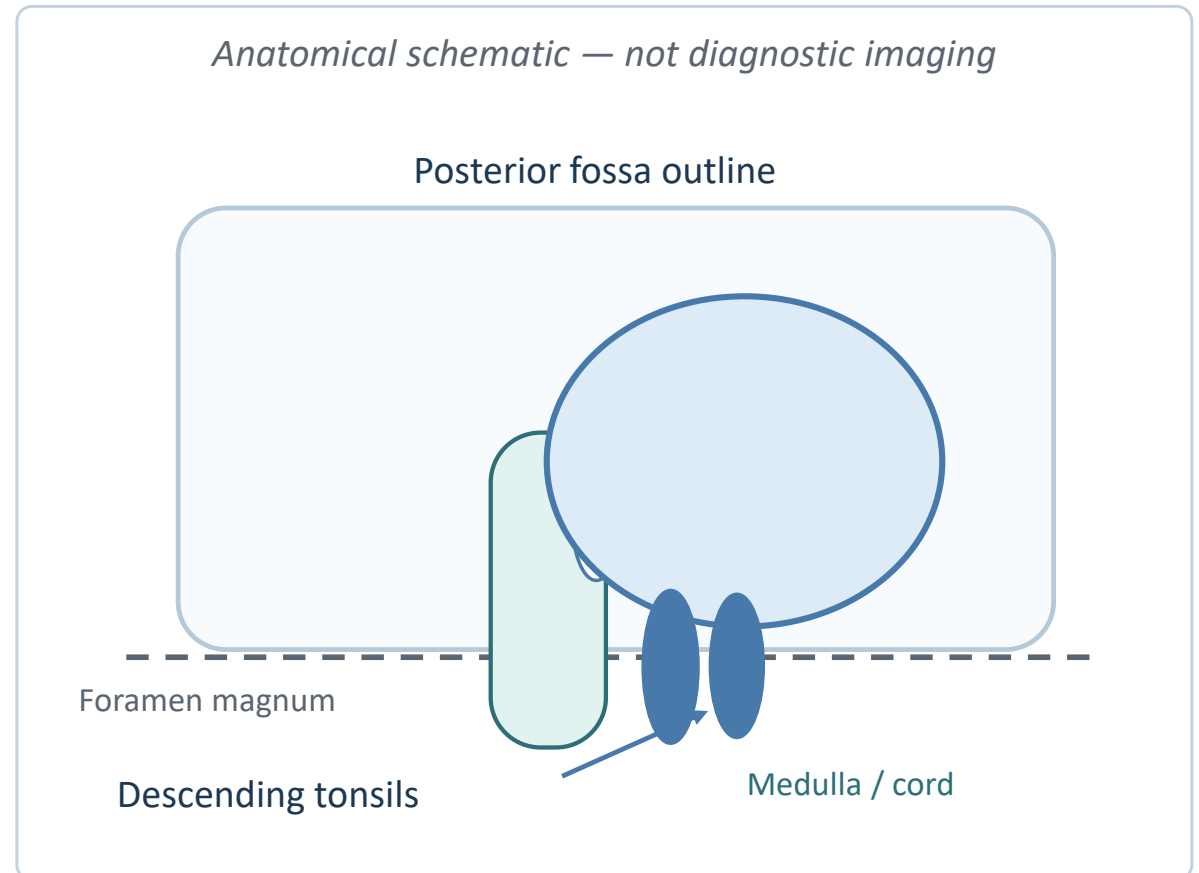
- Some individuals have a silent anatomical abnormality.
- Symptoms may arise from CSF-flow impairment, medullary compression, or a syrinx.
- Anatomical recognition and clinical manifestations are related but not identical.



Silent malformation and symptomatic disease are both possible.

Chiari I: The stated treatment implication

- Symptoms, when present, can usually be corrected by neurosurgical intervention.
- This statement concerns potentially symptomatic Chiari I, not a blanket indication for surgery.
- Detailed operative selection criteria are outside this supplied source.



Do not infer treatment for an asymptomatic patient from morphology alone.

Case 1: Low cerebellar tonsils

- A patient has low-lying cerebellar tonsils extending into the cervical canal.
- A related spinal cord fluid cavity is described.
- Which posterior fossa abnormality best matches this anatomical pattern?

Anatomical schematic — not diagnostic imaging

Interpret the anatomy

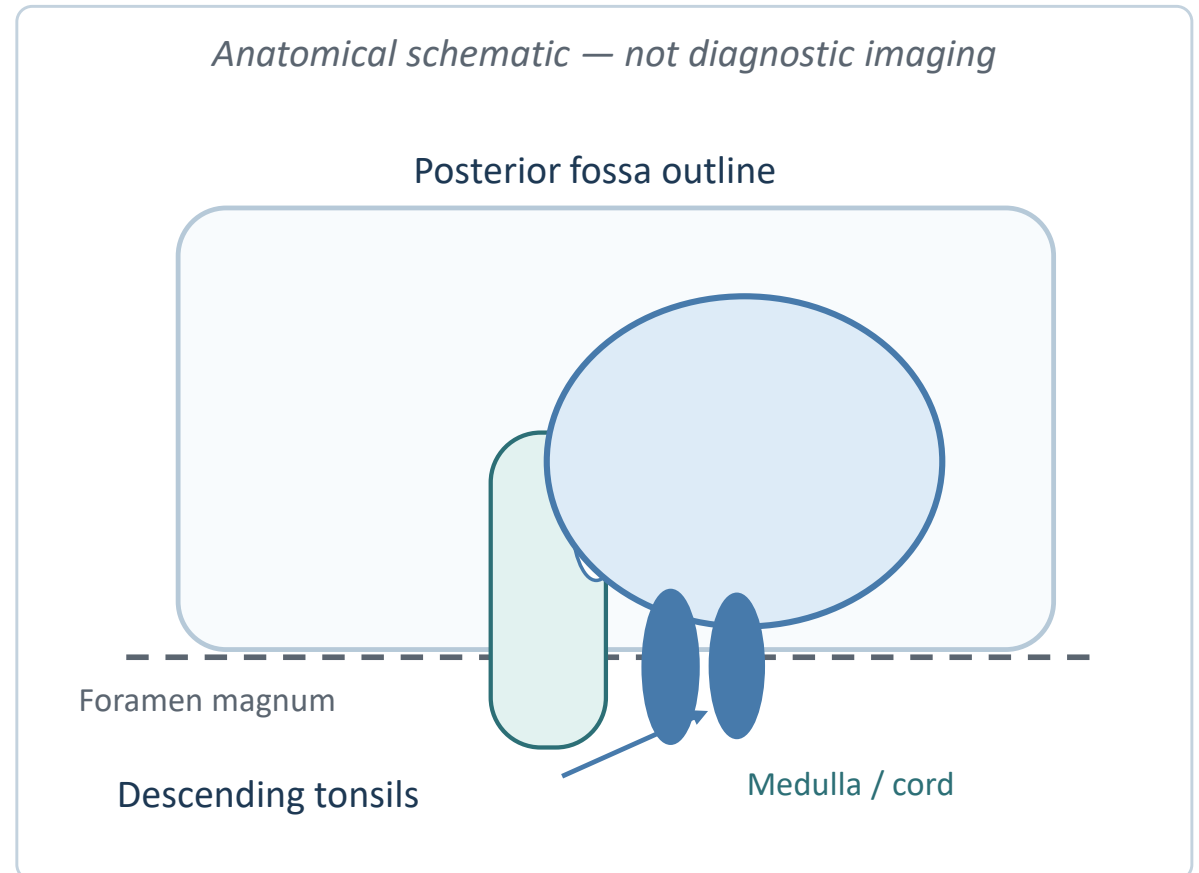
What feature is most discriminating?

Use a source-supported pattern, not an assumed threshold.

Identify the malformation and explain the spinal association.

Case 1 reasoning: Chiari I

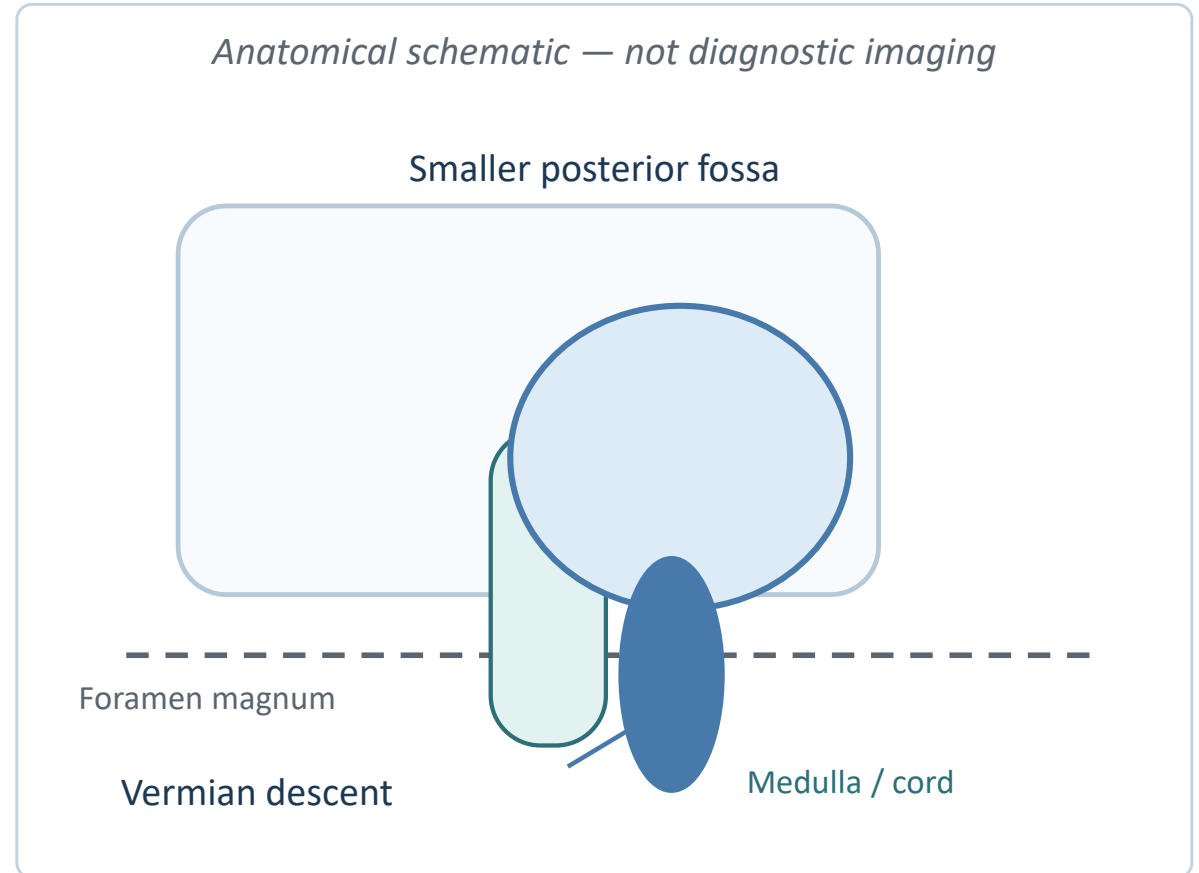
- Tonsillar extension through the foramen magnum defines Chiari I.
- Associated syringomyelia/hydromyelia is explicitly.
- The anatomical clues do not establish Chiari II without its additional pattern.



Differentiate by the displaced structure and associated morphology.

Chiari II is a complex posterior fossa malformation

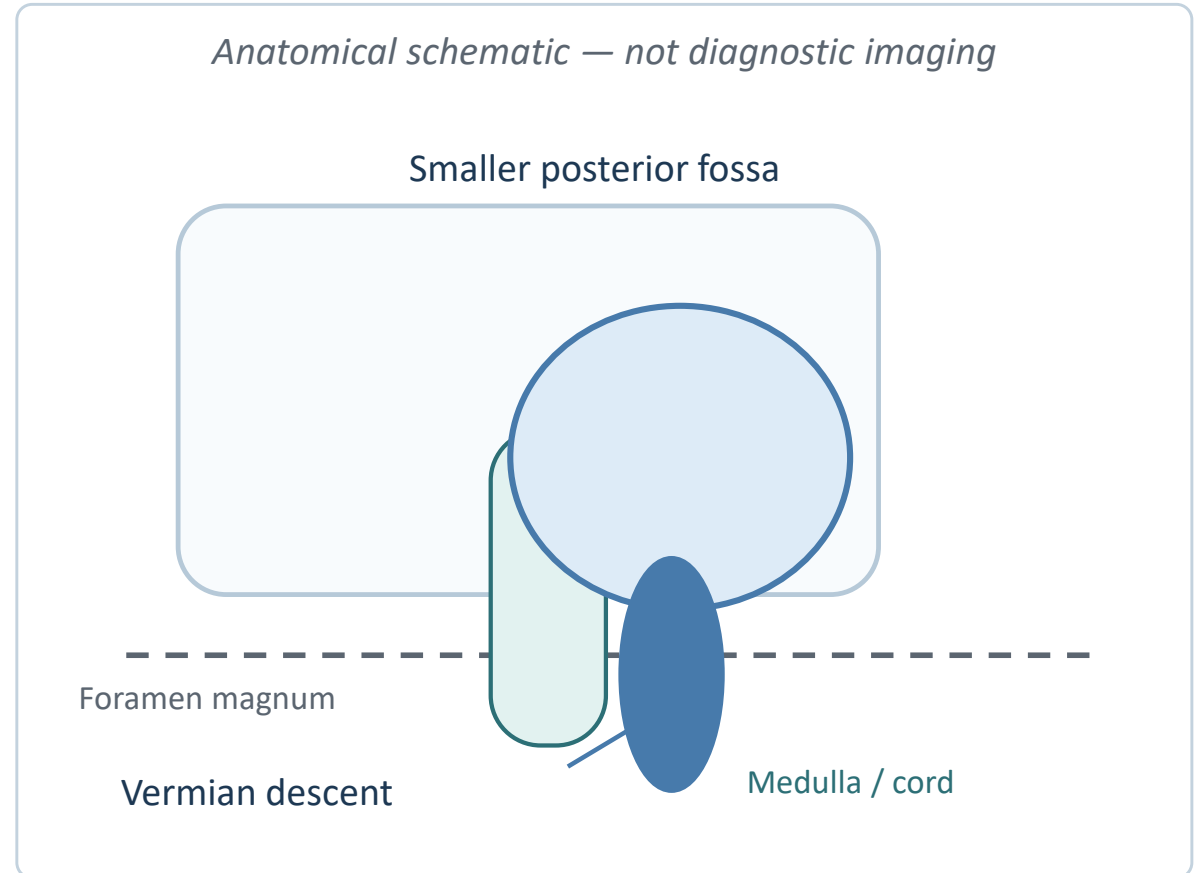
- Also referred to as Arnold–Chiari malformation in the source.
- Its defining pattern includes a small posterior fossa and malformed midline cerebellum.
- The cerebellar vermis extends downward through the foramen magnum.



Chiari II is not simply a more extensive Chiari I.

Chiari II: Characteristic sagittal anatomy

- Small posterior fossa confines abnormal hindbrain structures.
- Midline cerebellar tissue is misshapen.
- The vermis extends caudally beyond the foramen magnum.

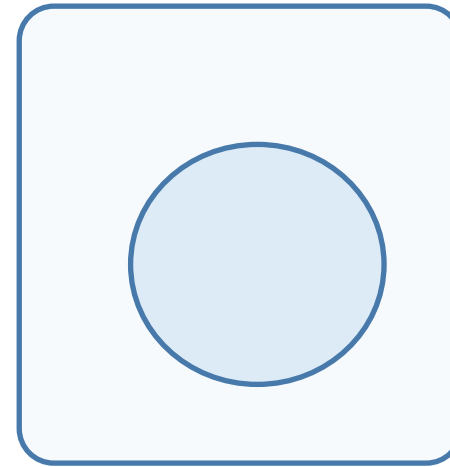


Schematic: Downward vermician extension in a small fossa.

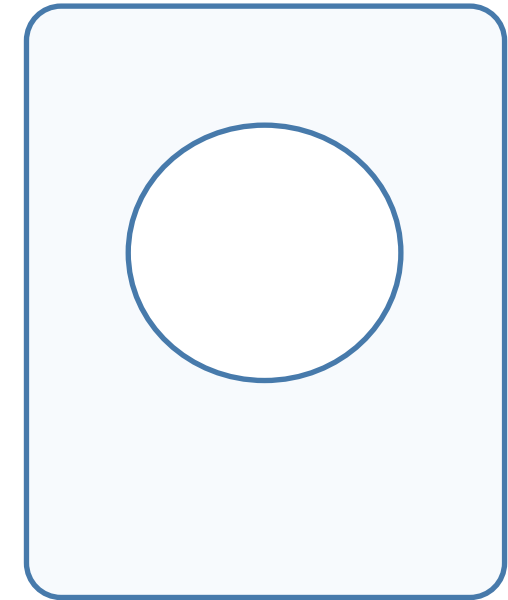
A small posterior fossa is a defining feature of Chiari II

- Robbins explicitly describes the posterior fossa as small.
- The reduced compartment accompanies downward displacement of hindbrain tissues.
- It contrasts directly with the expanded posterior fossa of Dandy–Walker.

Anatomical schematic — not diagnostic imaging



Small posterior fossa

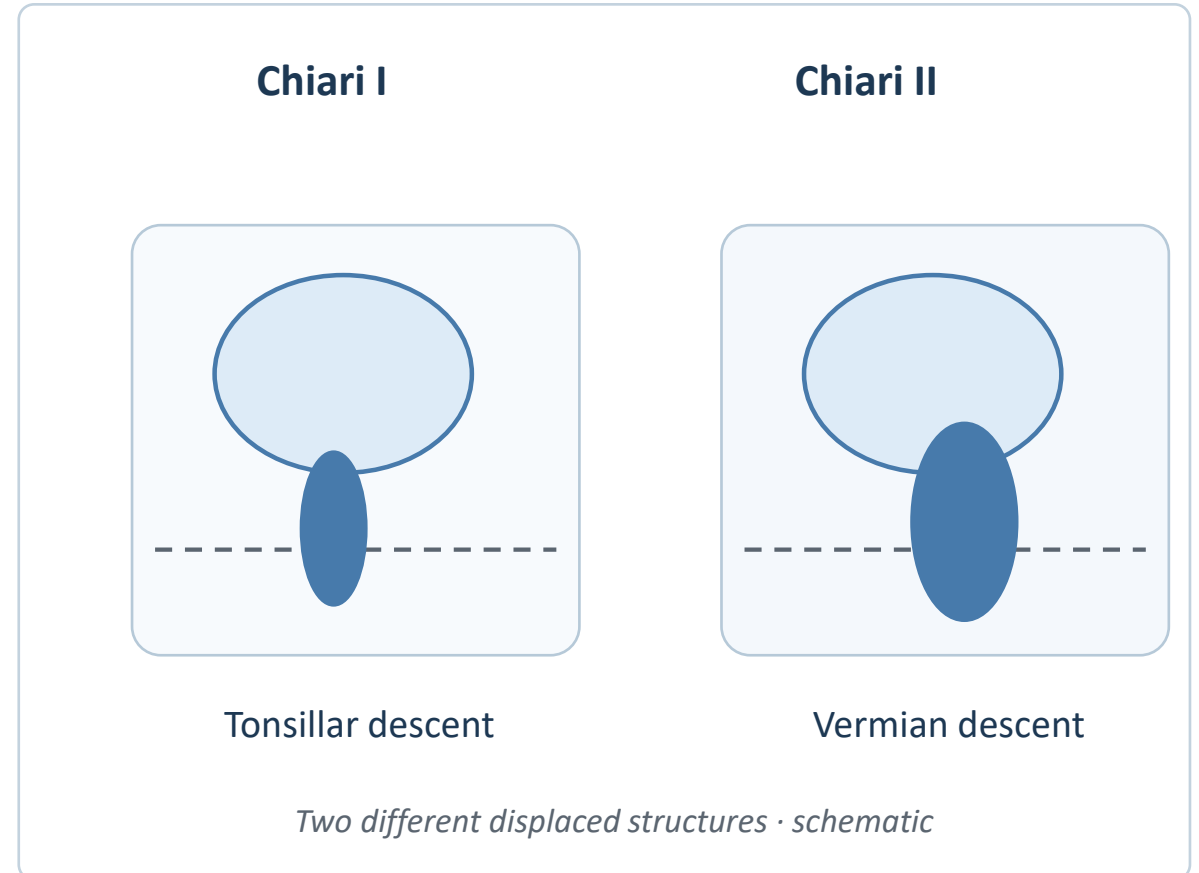


Enlarged posterior fossa

Fossa size is an important anatomical discriminator.

Chiari II: The vermis extends below the foramen magnum

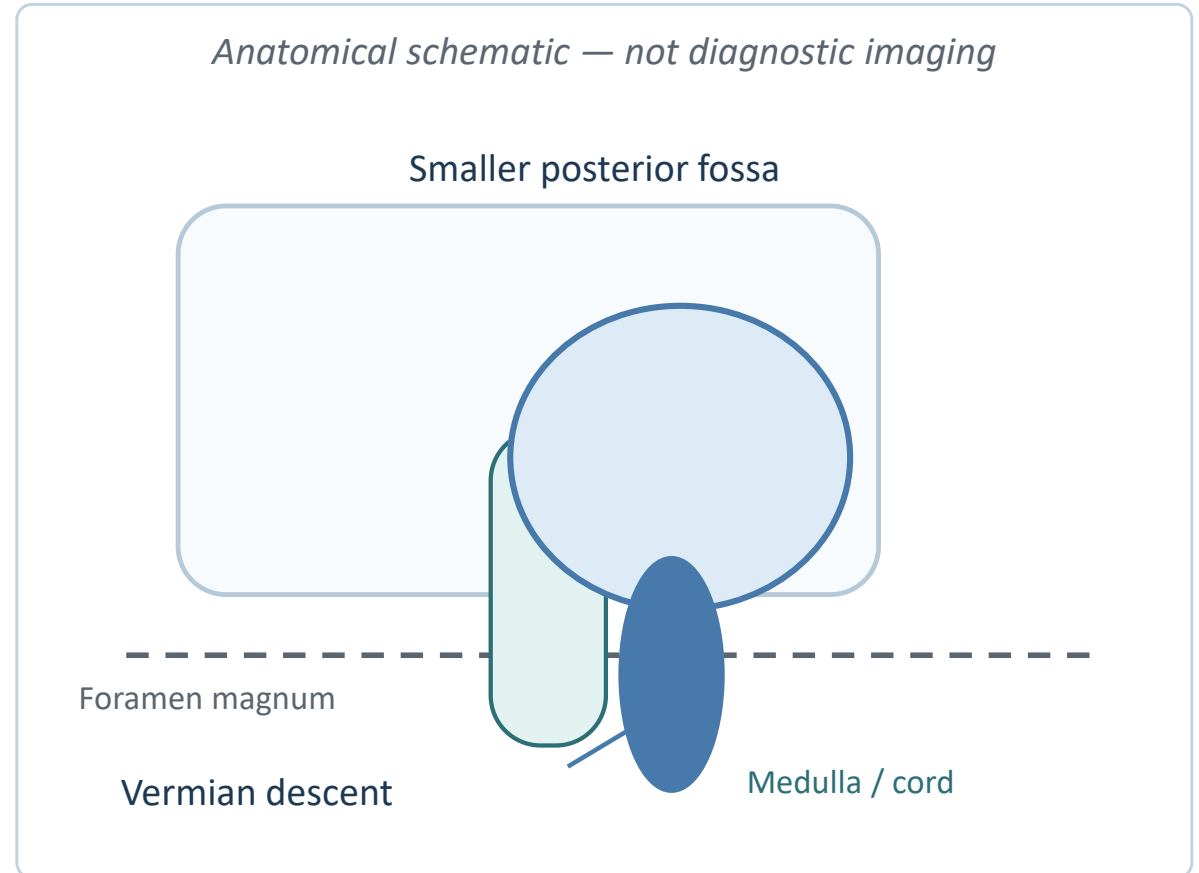
- The midline cerebellum is misshapen.
- The inferior displacement involves the vermis.
- This differs from the named low-lying tonsils of Chiari I.



Be precise about which cerebellar structure is displaced.

Caudal displacement may involve the medulla in Chiari II

- Caudal medullary displacement among additional abnormalities.
- The medulla is anatomically contiguous with the cervical spinal cord.
- The lesion extends beyond cerebellar vermian shape alone.

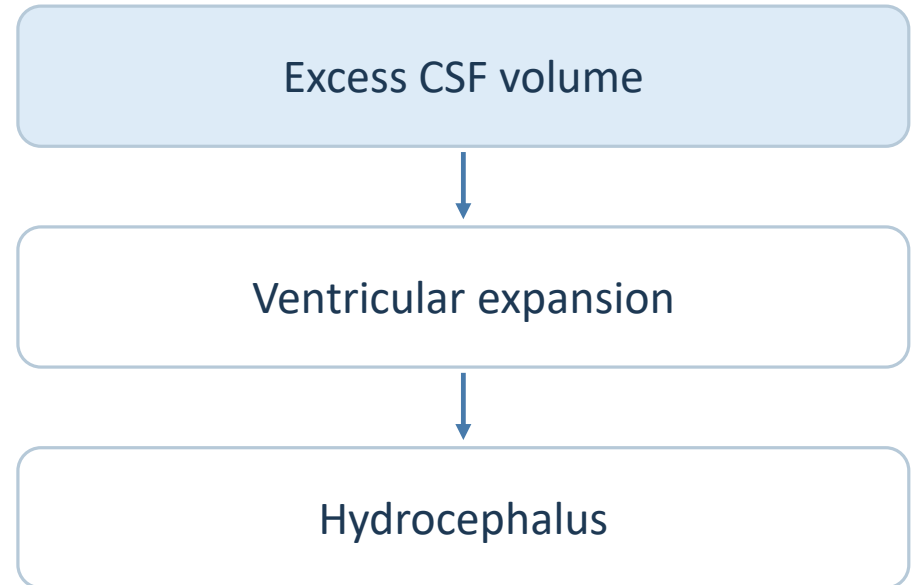


Look for combined cerebellar and brainstem distortion.

Hydrocephalus is almost invariable in Chiari II

- The source describes hydrocephalus as present almost invariably.
- Hydrocephalus denotes excessive CSF accumulation within the ventricles.
- Its association should be assessed as part of the syndrome, not ignored.

Anatomical schematic — not diagnostic imaging

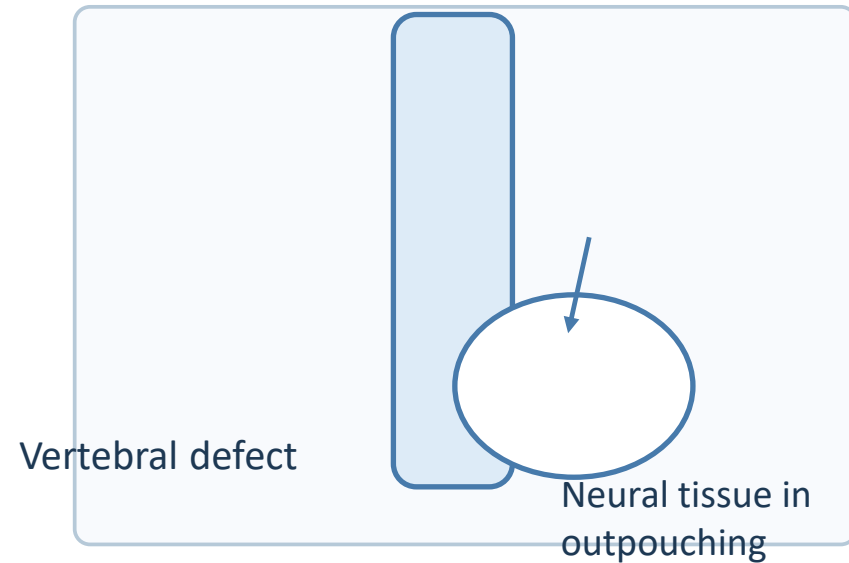


Strong association: Chiari II ↔ hydrocephalus.

Lumbar myelomeningocele strongly accompanies Chiari II

- An almost invariable lumbar myelomeningocele.
- Myelomeningocele includes neural tissue extending through a vertebral defect.
- This extracranial association helps recognize the full malformation.

Anatomical schematic — not diagnostic imaging

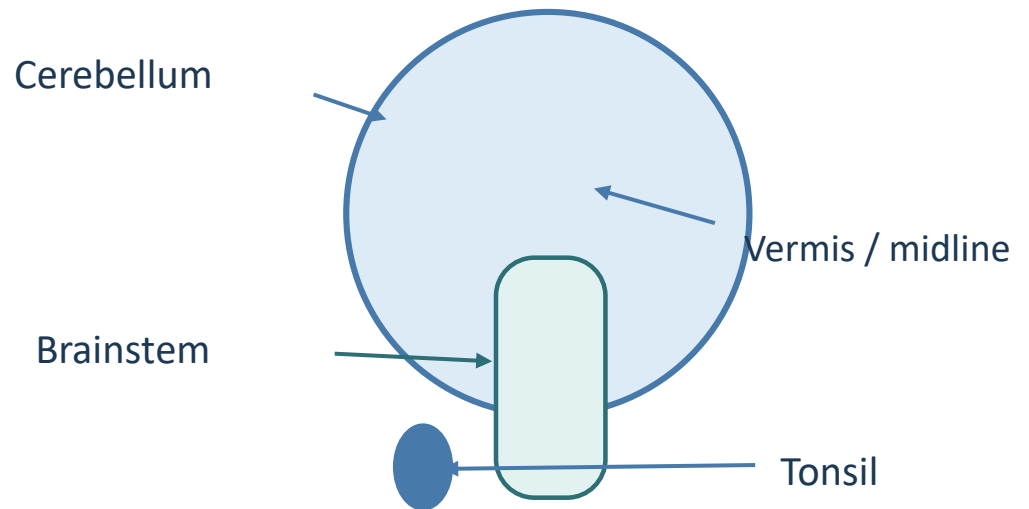


Posterior fossa and spinal dysraphism can form one pattern.

The tectum may also be malformed in Chiari II

- Malformation of the tectum is listed among associated abnormalities.
- This emphasizes that hindbrain anomalies may involve several connected regions.
- Robbins does not specify an individual tectal morphology in this excerpt.

Anatomical schematic — not diagnostic imaging

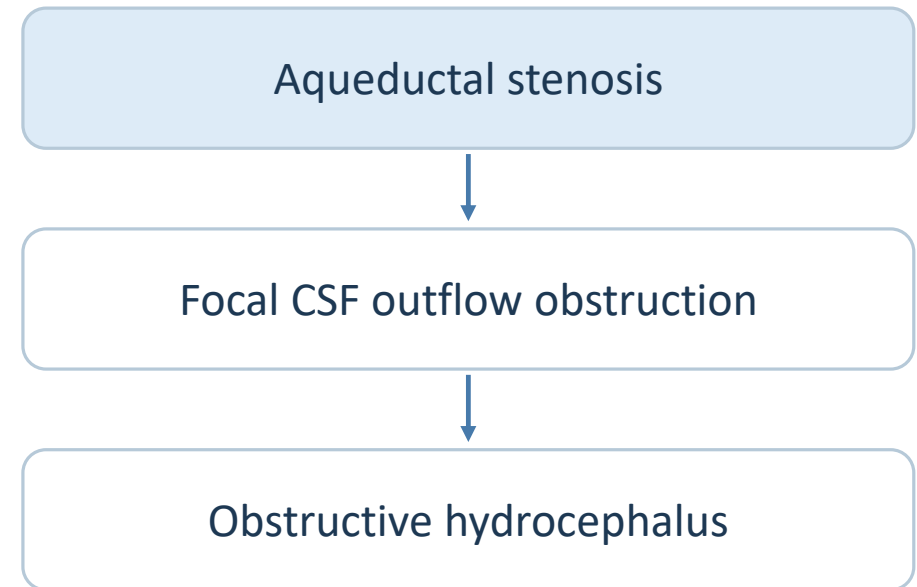


Do not invent a specific tectal shape absent from the source.

Aqueductal stenosis is an associated Chiari II abnormality

- Stenosis of the cerebral aqueduct in the Chiari II constellation.
- Aqueductal narrowing can be a point of CSF-flow obstruction.
- This provides an anatomical connection with hydrocephalus.

Anatomical schematic — not diagnostic imaging

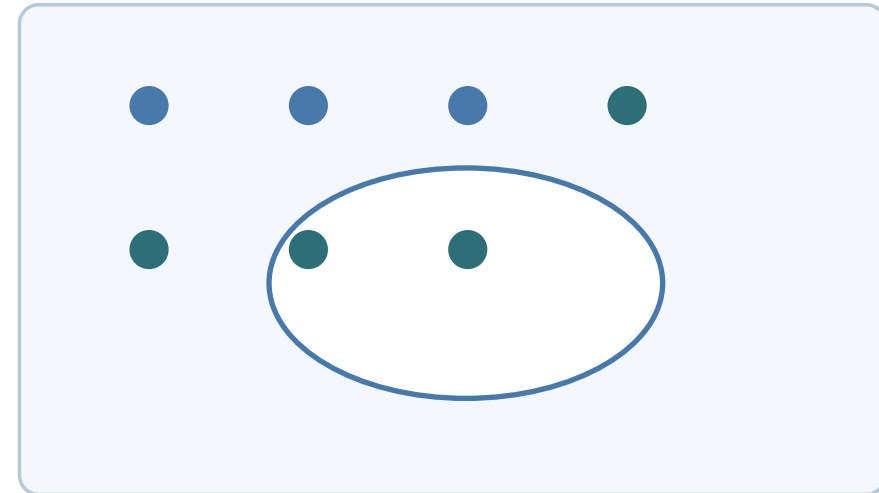


Aqueductal stenosis is one possible associated lesion.

Cerebral heterotopias may accompany Chiari II

- Heterotopias are listed among the possible associated cerebral changes.
- The neighboring Robbins section defines these as misplaced collections of neurons.
- Thus a hindbrain malformation can coexist with an abnormality of forebrain organization.

Anatomical schematic — not diagnostic imaging



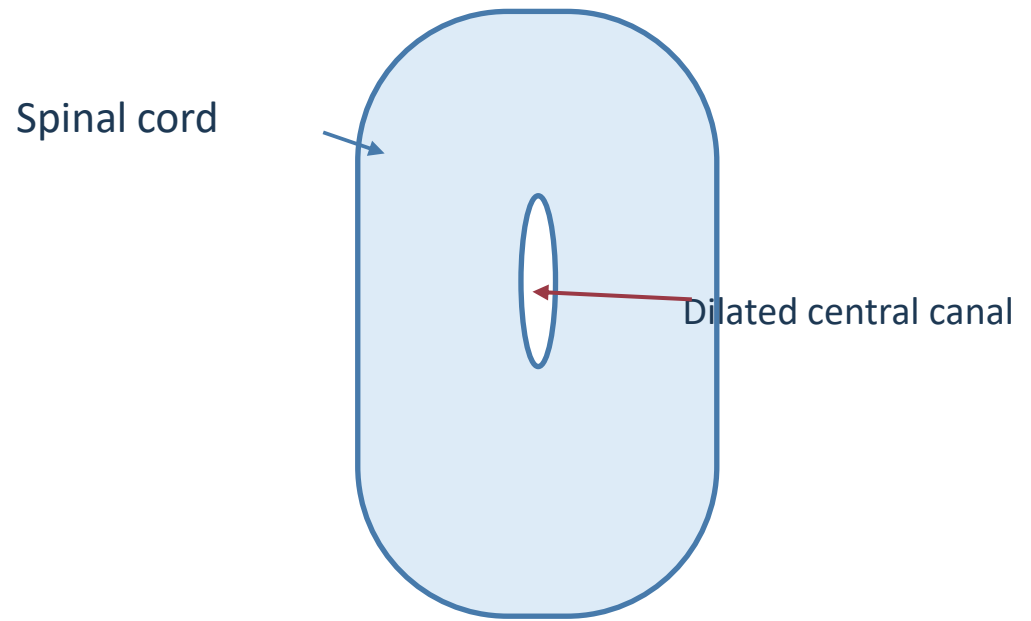
Misplaced neuronal clusters (schematic)

The lesion may extend beyond the posterior fossa.

Hydromyelia or syringomyelia can coexist with Chiari II

- Both spinal fluid-cavity patterns are included among associated abnormalities.
- Hydromyelia is dilatation of the ependyma-lined central canal.
- Syringomyelia is a cleft-like fluid cavity within the cord.

Anatomical schematic — not diagnostic imaging



Cord cross-section — schematic

Recognize the spinal association without conflating its two forms.

Chiari II: Obligatory-looking versus optional findings

- Core morphology: Small fossa, abnormal midline cerebellum, and vermian descent.
- Almost invariable associations: Hydrocephalus and lumbar myelomeningocele.
- Other potential findings: Medullary/tectal changes, aqueductal stenosis, heterotopias, cord cavities.

Anatomical schematic — not diagnostic imaging

Editable source-grounded anatomical
schematic

The source distinguishes a characteristic core from variable additions.

Chiari I and II differ in lesion complexity

Feature	Chiari I	Chiari II
Key descent	Cerebellar tonsils	Midline cerebellar vermis
Posterior fossa	Not specified as small in source	Small
Hydrocephalus	Not identified as almost invariable	Almost invariable
Myelomeningocele	Not defining	Lumbar; almost invariable

The distinction is anatomical and syndromic.

Case 2: Vertebral defect and hydrocephalus

- A patient has a lumbar myelomeningocele and hydrocephalus.
- Midline imaging shows a small posterior fossa and caudally displaced cerebellar vermis.
- Which malformation explains the combined findings?

Anatomical schematic — not diagnostic imaging

Interpret the anatomy

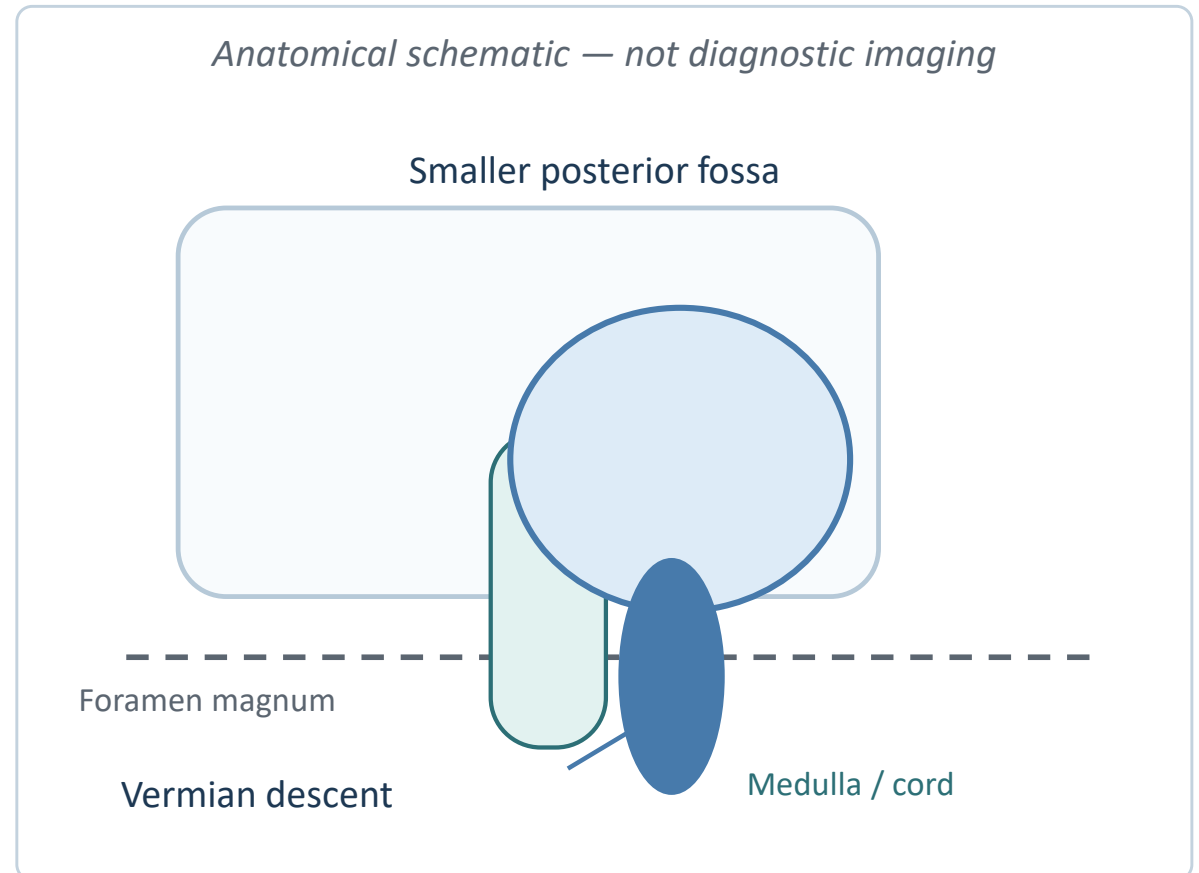
What feature is most discriminating?

Use a source-supported pattern, not an assumed threshold.

Consider the syndrome rather than any single abnormality.

Case 2 reasoning: Chiari II

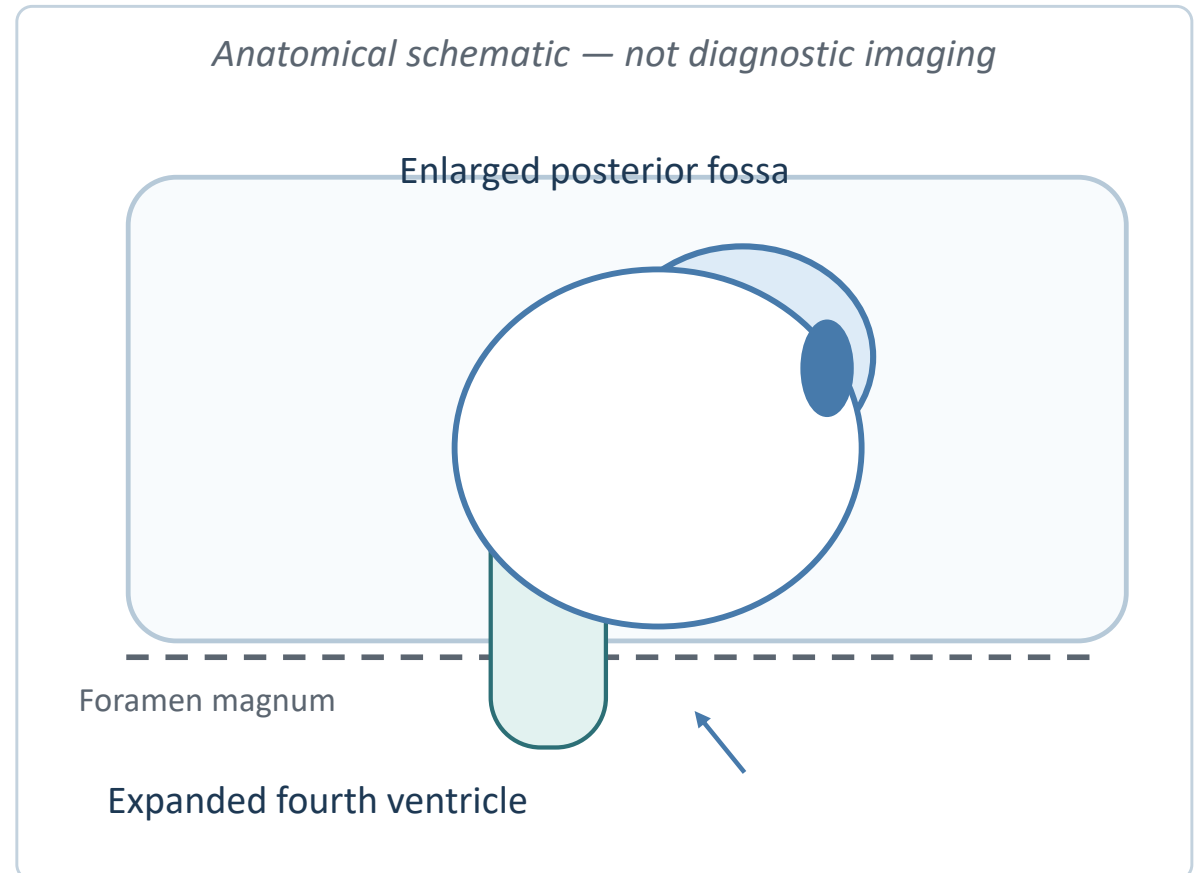
- Vermian descent within a small posterior fossa identifies the core morphology.
- Hydrocephalus and lumbar myelomeningocele are the strongly linked associations.
- This combination fits Chiari II rather than isolated Chiari I.



The conjunction of intracranial and spinal findings is decisive.

Dandy–Walker malformation enlarges the posterior fossa

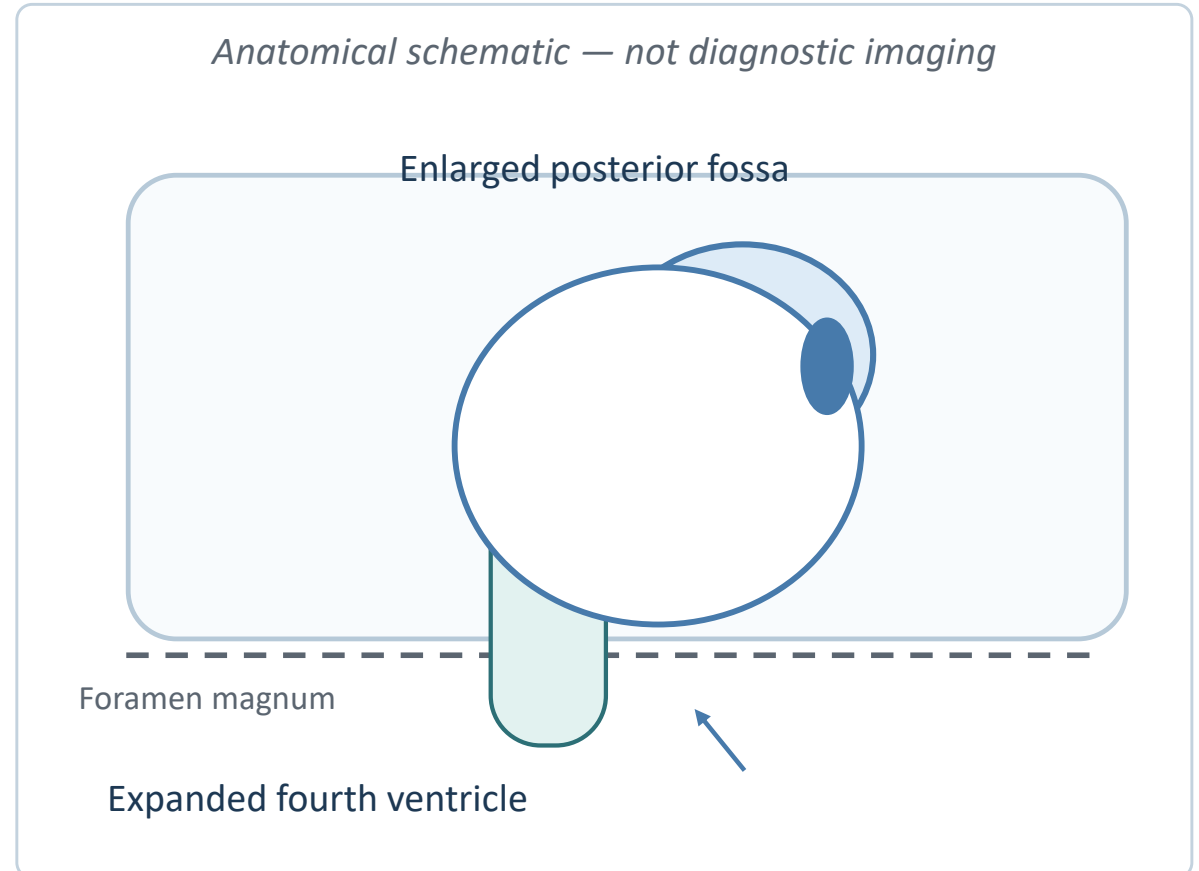
- The posterior fossa is enlarged, not small.
- The cerebellar vermis is absent or rudimentary.
- A large midline cyst occupies the site of the deficient vermis.



The spatial pattern is the opposite of Chiari II crowding.

An enlarged fossa frames Dandy–Walker morphology

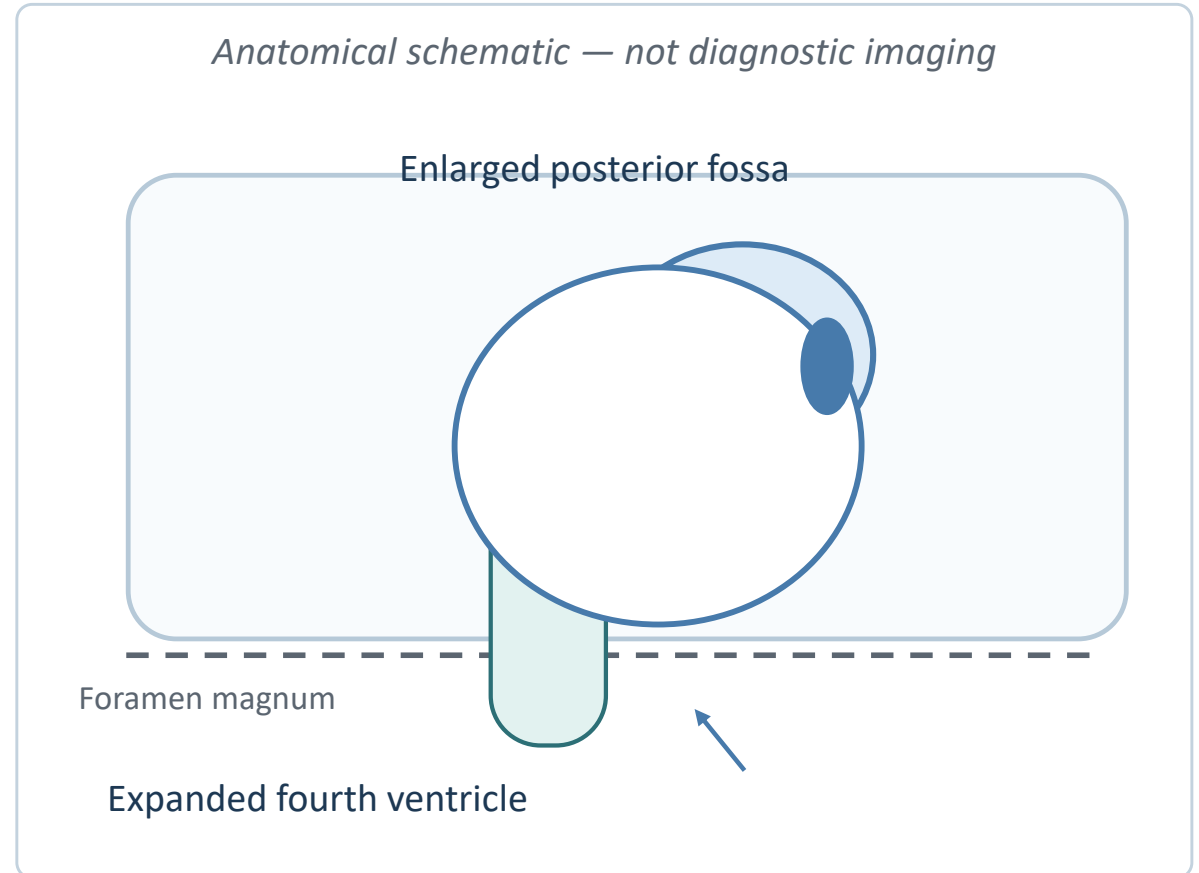
- An enlarged posterior fossa is explicitly part of the malformation.
- The expanded compartment is associated with the large midline cyst.
- Fossa size should be considered together with vermian development.



Do not interpret the cyst in isolation.

The vermis may be absent or only rudimentary

- The source permits complete absence of the vermis.
- Alternatively, a small anterior vermian remnant may be present.
- Both patterns are compatible with the described Dandy–Walker malformation.

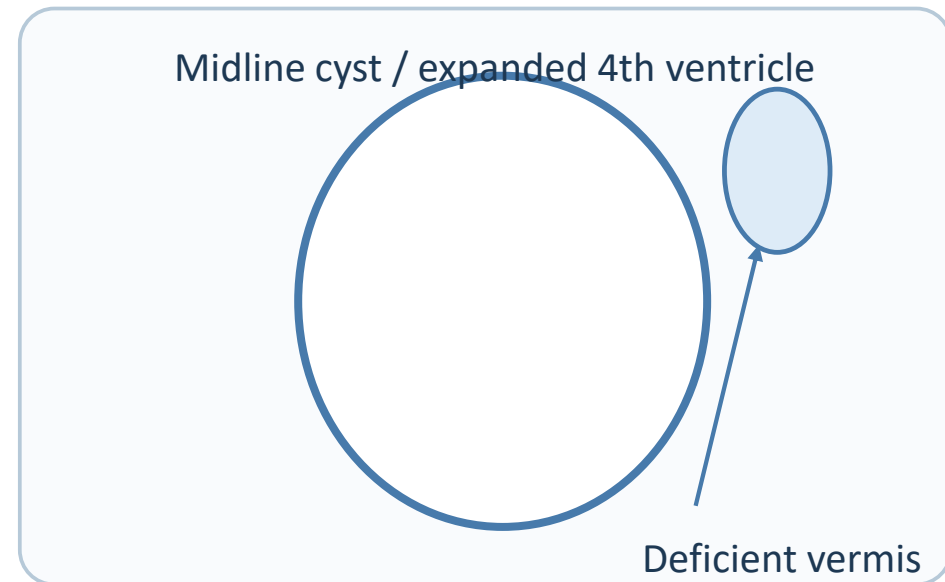


Vermian status is central, but not an all-or-none criterion.

The large cyst represents an expanded fourth ventricle

- The midline cyst is interpreted as the expanded, roofless fourth ventricle.
- Normal vermian formation has not occurred.
- The lesion is not merely a nonspecific cyst adjacent to the cerebellum.

Anatomical schematic — not diagnostic imaging



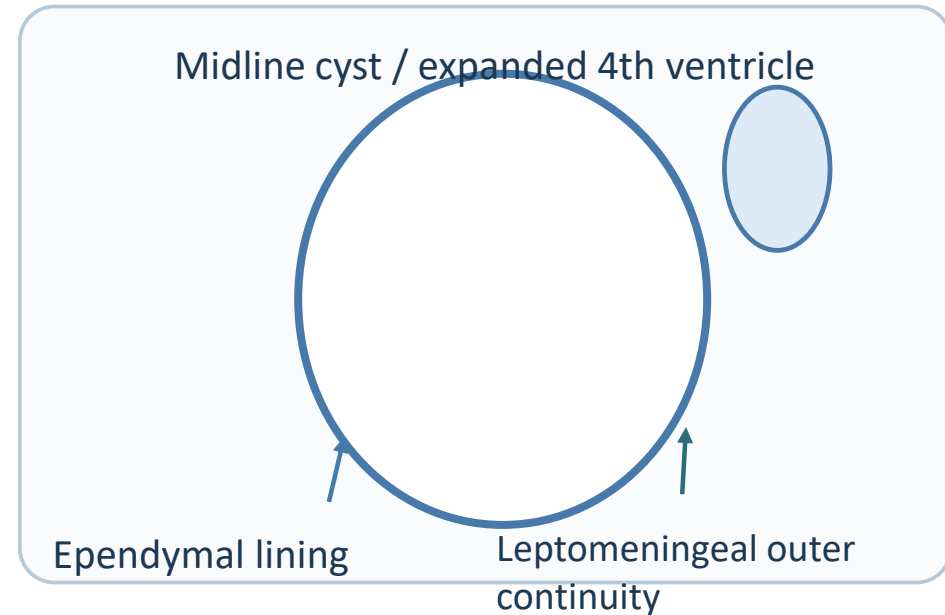
Schematic; Not a specimen image

Identify the anatomical identity of the fluid space.

Dandy–Walker cyst has two different boundaries

- Its inner surface is lined by ependyma.
- Its outer surface is contiguous with leptomeninges.
- These relationships define the cyst morphology.

Anatomical schematic — not diagnostic imaging



Schematic; Not a specimen image

Ependymal lining and leptomeningeal outer continuity are distinct.

The roofless fourth ventricle links two abnormalities

- Marked vermian underdevelopment alters the normal roof region.
- The fourth ventricle becomes a large midline cystic space.
- This accounts for the conspicuous altered posterior fossa configuration.

Anatomical schematic — not diagnostic imaging

Absent / rudimentary vermis



Roofless fourth ventricle



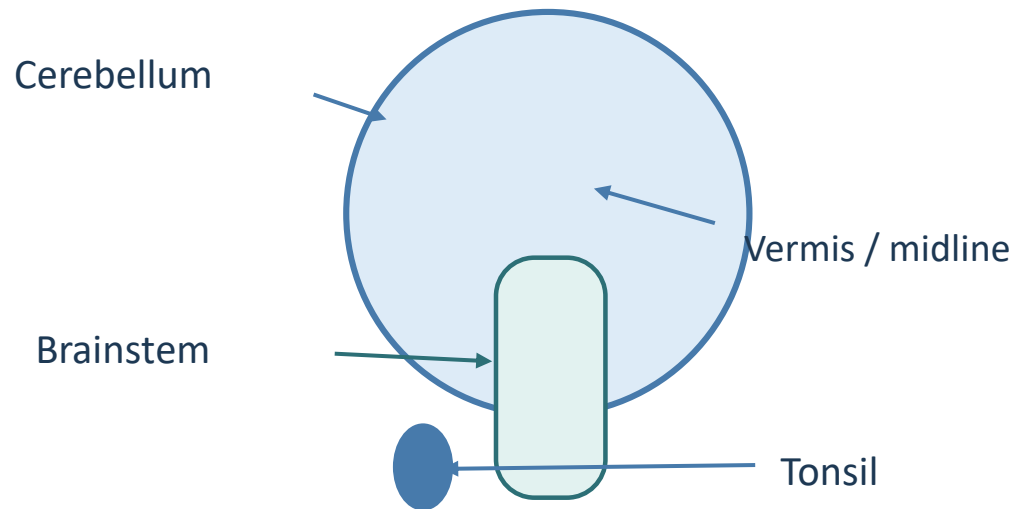
Large midline ventricular cyst

Vermian defect and ventricular expansion are connected anatomically.

Brainstem nuclei may also be dysplastic

- Dysplasia of brainstem nuclei is commonly found in association.
- Thus Dandy–Walker is not necessarily restricted to the cerebellar vermis.
- The source does not specify a particular microscopic diagnostic criterion.

Anatomical schematic — not diagnostic imaging



Remember the possible associated brainstem abnormality.

Chiari II and Dandy–Walker have opposite fossa sizes

Pattern	Chiari II	Dandy–Walker
Fossa size	Small	Enlarged
Vermis	Misshapen; displaced caudally	Absent or rudimentary
Dominant space	Crowded hindbrain	Expanded fourth-ventricular cyst
Other clue	Myelomeningocele ± hydrocephalus	Brainstem nuclear dysplasia may occur

Focus on structural direction, not eponyms.

Case 3: Large posterior fossa and midline cyst

- Imaging describes an expanded posterior fossa.
- The vermis is markedly deficient; A large cystic structure occupies the midline.
- What is the most specific developmental pattern?

Anatomical schematic — not diagnostic imaging

Interpret the anatomy

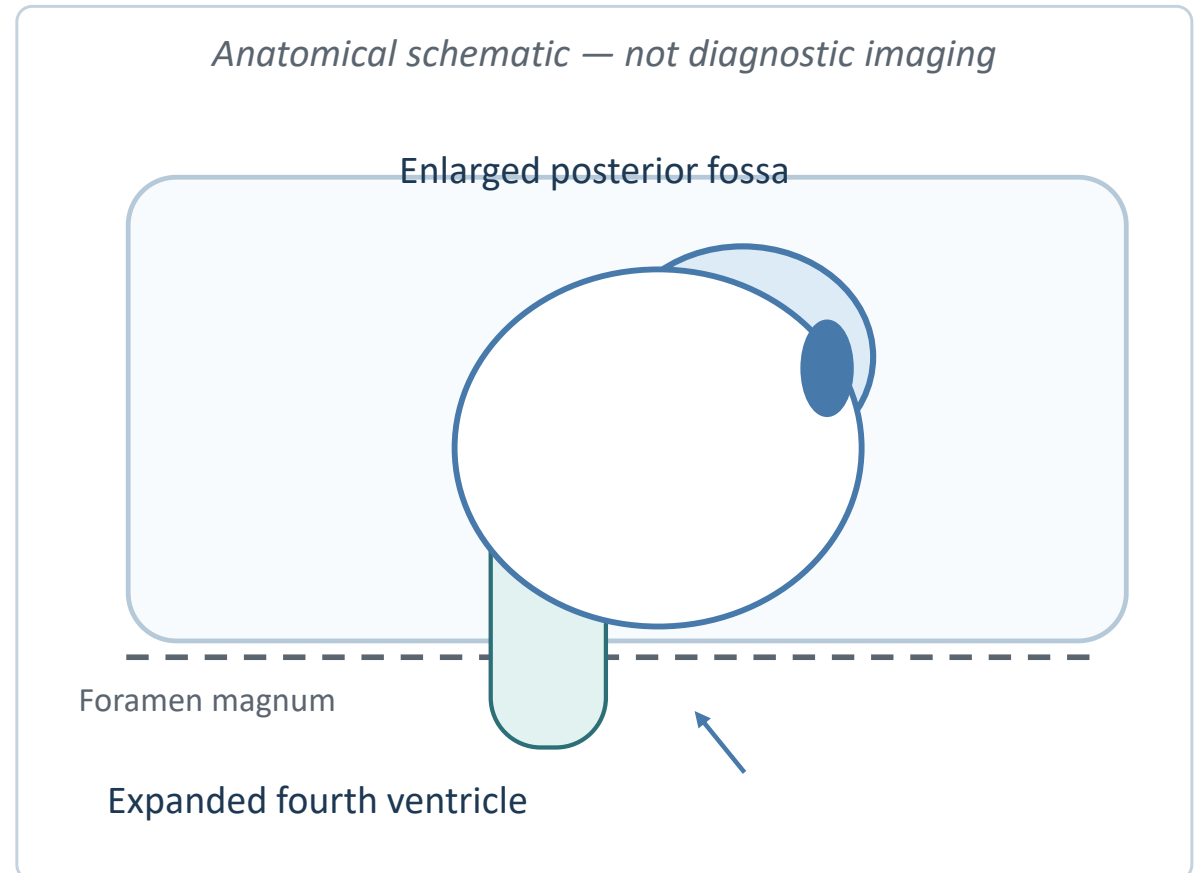
What feature is most discriminating?

Use a source-supported pattern, not an assumed threshold.

Explain where the cyst comes from anatomically.

Case 3 reasoning: Dandy–Walker malformation

- The combination of enlarged fossa, vermian deficiency, and midline cyst is characteristic.
- The cyst corresponds to the expanded, roofless fourth ventricle.
- This differs from a small posterior fossa with hindbrain descent.

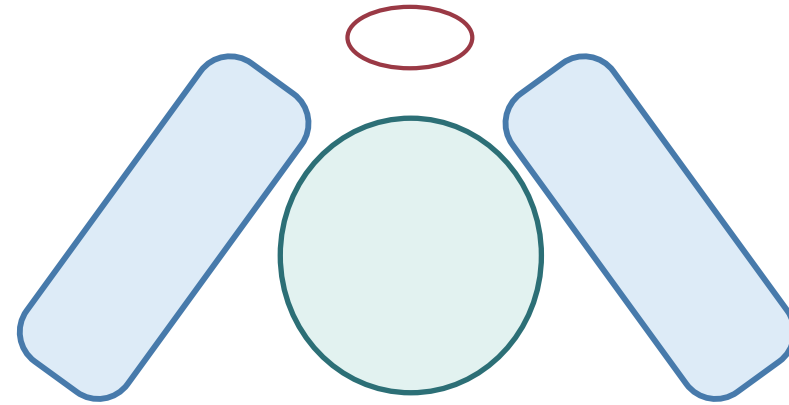


The cyst is a malformed ventricular compartment.

Joubert syndrome has a characteristic hindbrain configuration

- The cerebellar vermis is hypoplastic.
- Superior cerebellar peduncles show rotation and apparent elongation.
- The brainstem contour is altered, together producing the molar tooth sign.

Anatomical schematic — not diagnostic imaging



Rotated superior cerebellar peduncles

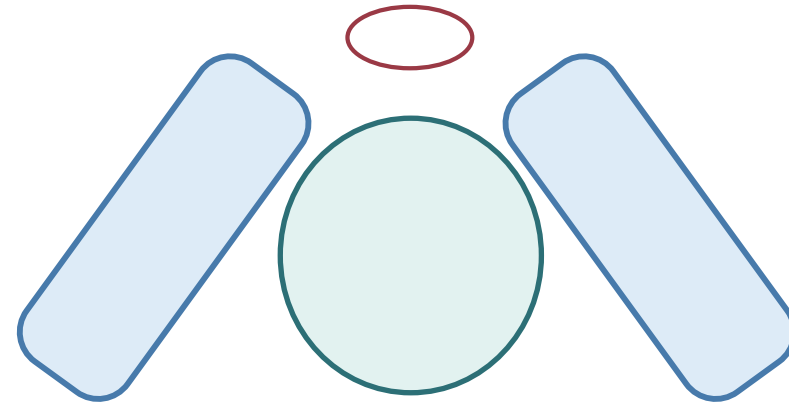
Molar tooth configuration (conceptual; Not an MRI)

Diagnosis rests on a composite imaging configuration.

Vermian hypoplasia is part of the Joubert pattern

- The cerebellar vermis is underdeveloped.
- This abnormality alone does not distinguish Joubert from Dandy–Walker.
- Associated peduncular and brainstem changes establish the described signature.

Anatomical schematic — not diagnostic imaging



Rotated superior cerebellar peduncles

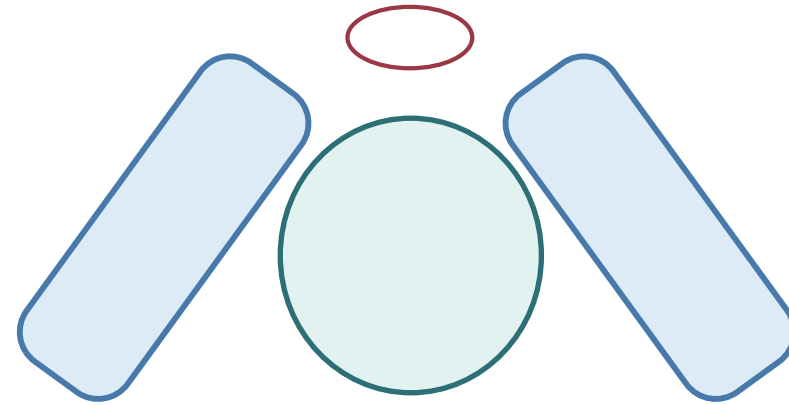
Molar tooth configuration (conceptual; Not an MRI)

Use combined anatomy rather than a single feature.

Superior cerebellar peduncles change shape and orientation

- The source describes rotation of the superior cerebellar peduncles.
- They appear elongated on imaging.
- These changes must be interpreted together with the vermian and brainstem findings.

Anatomical schematic — not diagnostic imaging



Rotated superior cerebellar peduncles

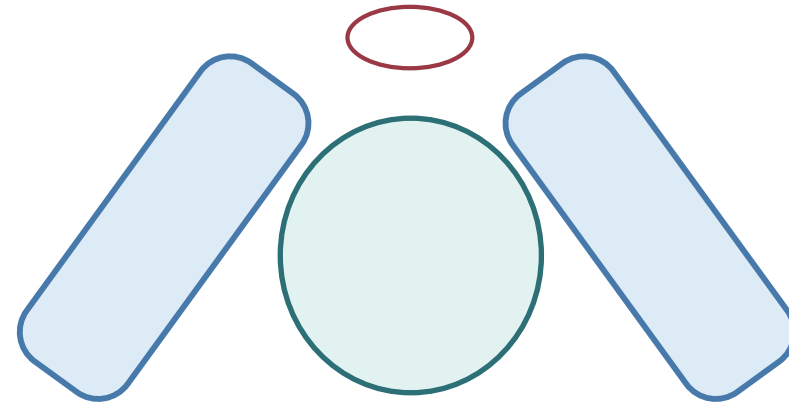
Molar tooth configuration (conceptual; Not an MRI)

Peduncular morphology helps establish the pattern.

Altered brainstem shape contributes to Joubert imaging

- The posterior fossa phenotype also affects the brainstem contour.
- The abnormal peduncles and brainstem shape jointly create the imaging sign.
- The source does not attribute the sign to isolated vermian hypoplasia.

Anatomical schematic — not diagnostic imaging



Rotated superior cerebellar peduncles

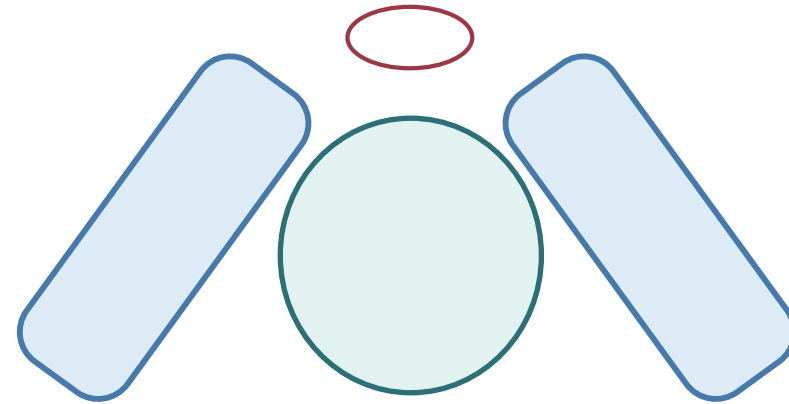
Molar tooth configuration (conceptual; Not an MRI)

A combined configuration yields the characteristic appearance.

The molar tooth sign is a composite appearance

- Vermian hypoplasia provides an important anatomical context.
- Rotated, apparently elongated superior cerebellar peduncles form prominent limbs.
- An altered brainstem outline completes the characteristic imaging configuration.

Anatomical schematic — not diagnostic imaging



Rotated superior cerebellar peduncles

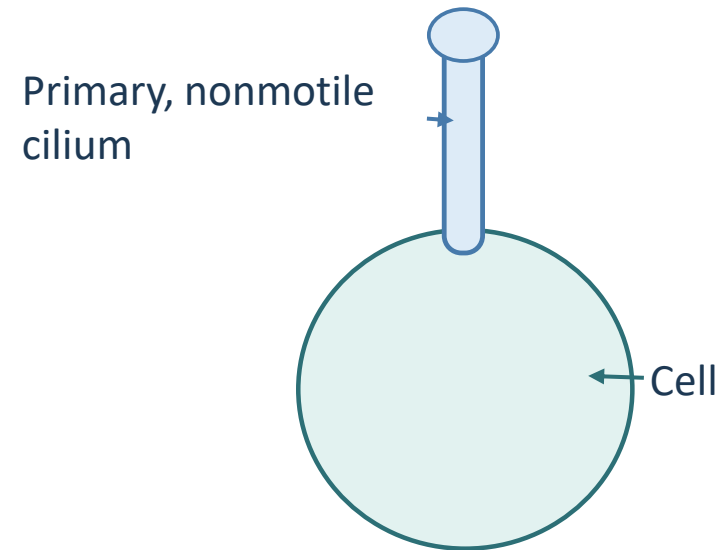
Molar tooth configuration (conceptual; Not an MRI)

A schematic of an imaging sign is not a patient MRI.

Joubert syndrome belongs to a ciliopathy spectrum

- Joubert and related disorders to diverse genetic mutations.
- The affected genes encode components of the primary (nonmotile) cilium.
- No single causal gene is specified in the excerpt.

Anatomical schematic — not diagnostic imaging

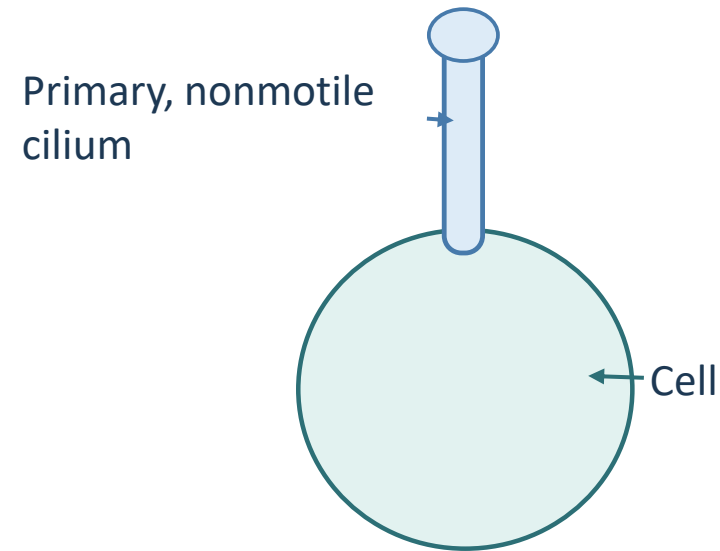


Genetic heterogeneity converges on the primary cilium.

Ciliary defects are the molecular category, not a single mutation

- The source identifies several different cilium-component genes as possible causes.
- Mutational diversity is compatible with a shared anatomical hindbrain phenotype.
- The supplied text does not establish genotype–phenotype rules or mutation frequencies.

Anatomical schematic — not diagnostic imaging



Multiple affected cilium-component genes

Avoid false gene-level specificity absent from the source.

Joubert and Dandy–Walker share vermian abnormalities

Feature	Dandy–Walker	Joubert
Vermis	Absent or rudimentary	Hypoplastic
Fossa / cyst	Enlarged fossa; large fourth-ventricular cyst	Not defining in provided description
Imaging discriminator	Expanded, roofless fourth ventricle	Molar tooth sign
Mechanistic association	No specific gene class given here	Primary cilium genes

Their additional morphology separates them.

Case 4: A molar tooth appearance

- Imaging demonstrates vermian hypoplasia, unusual superior cerebellar peduncles, and a distorted brainstem contour.
- The combined morphology is called the “molar tooth sign.”
- Which malformation group and molecular category are suggested?

Anatomical schematic — not diagnostic imaging

Interpret the anatomy

What feature is most discriminating?

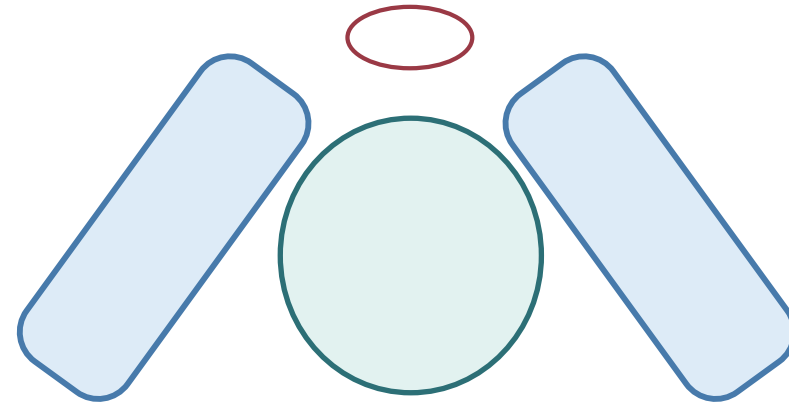
Use a source-supported pattern, not an assumed threshold.

Use both the imaging configuration and the genetic class.

Case 4 reasoning: Joubert-related disorder

- The composite hindbrain pattern identifies Joubert syndrome or a related disorder.
- The associated genes encode components of the primary, nonmotile cilium.
- This does not identify a particular gene or variant without further evidence.

Anatomical schematic — not diagnostic imaging



Rotated superior cerebellar peduncles

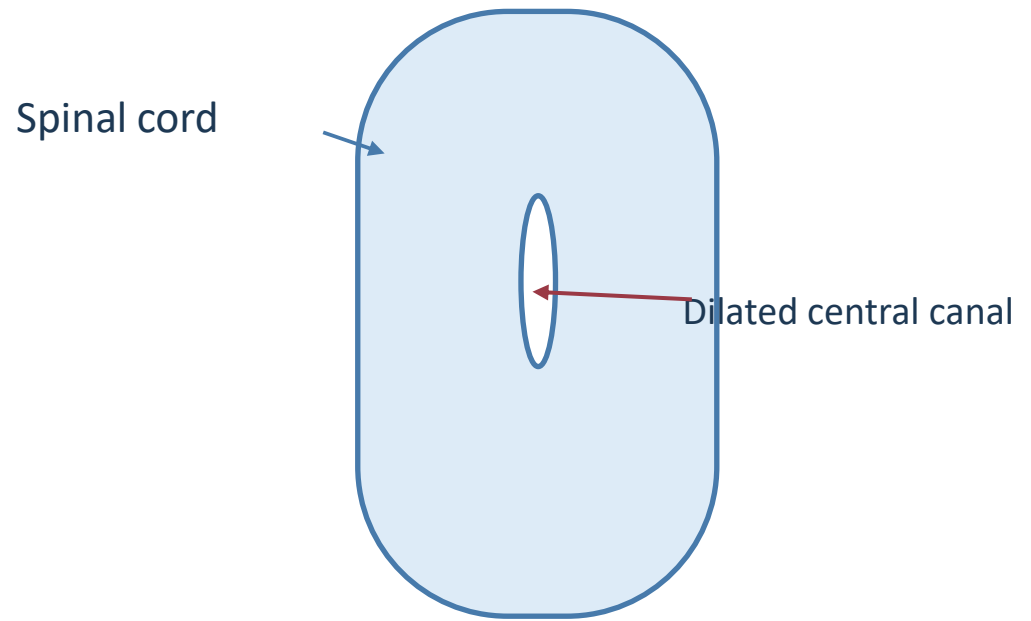
Molar tooth configuration (conceptual; Not an MRI)

Molar tooth anatomy plus ciliopathy association.

Hydromyelia and syringomyelia are not synonymous

- Hydromyelia: Enlargement of the normal ependyma-lined central canal.
- Syringomyelia: A new fluid-filled cleft-like cavity within the cord.
- Both may accompany the Chiari malformations.

Anatomical schematic — not diagnostic imaging



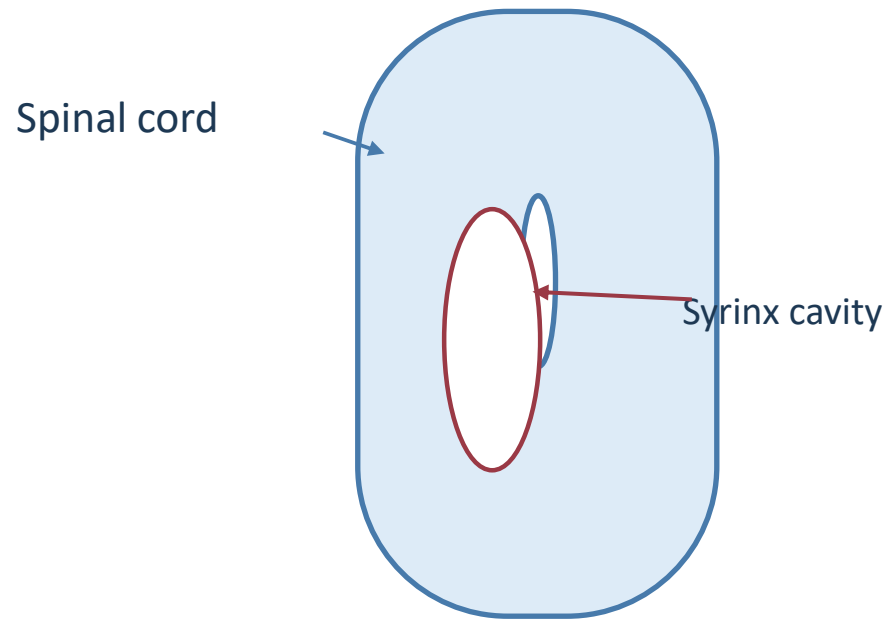
Cord cross-section — schematic

The lining and anatomical location distinguish the two entities.

A syrinx damages spinal cord parenchyma

- The cavity is associated with destruction of adjacent gray and white matter.
- Dense reactive gliosis surrounds the involved region.
- This cord injury explains why an associated fluid cavity can be symptomatic.

Anatomical schematic — not diagnostic imaging



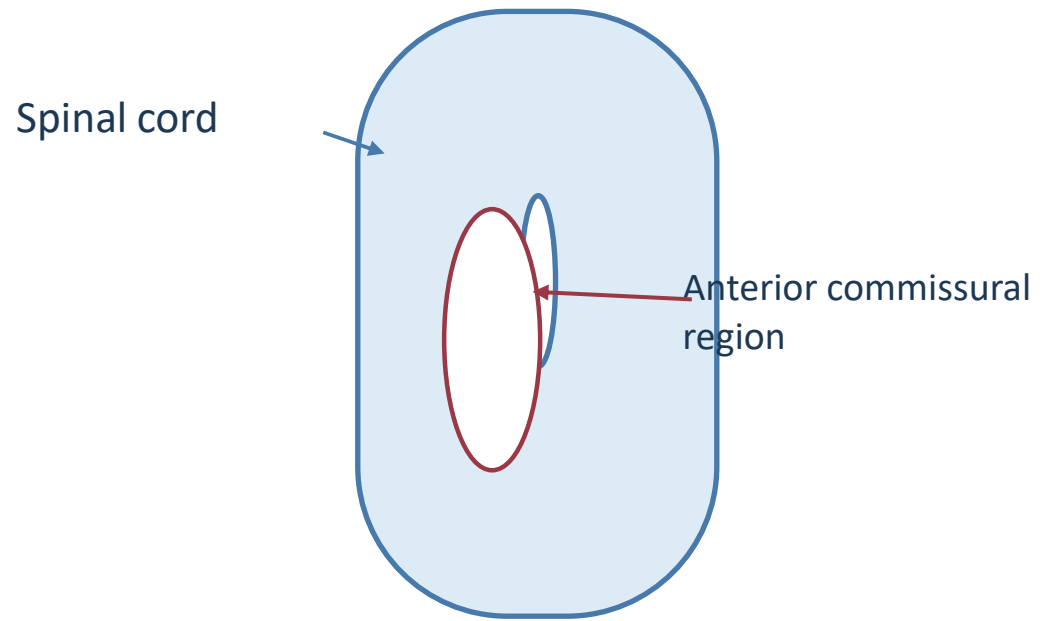
Cord cross-section — schematic

A syrinx is not simply a benign reservoir of fluid.

Syringomyelia can disrupt crossing sensory fibers

- The characteristic syndrome is loss of pain and temperature sensation in the upper extremities.
- The interrupted fibers cross through the anterior spinal commissure.
- This is a clinicopathological link made in the neighboring Robbins section.

Anatomical schematic — not diagnostic imaging



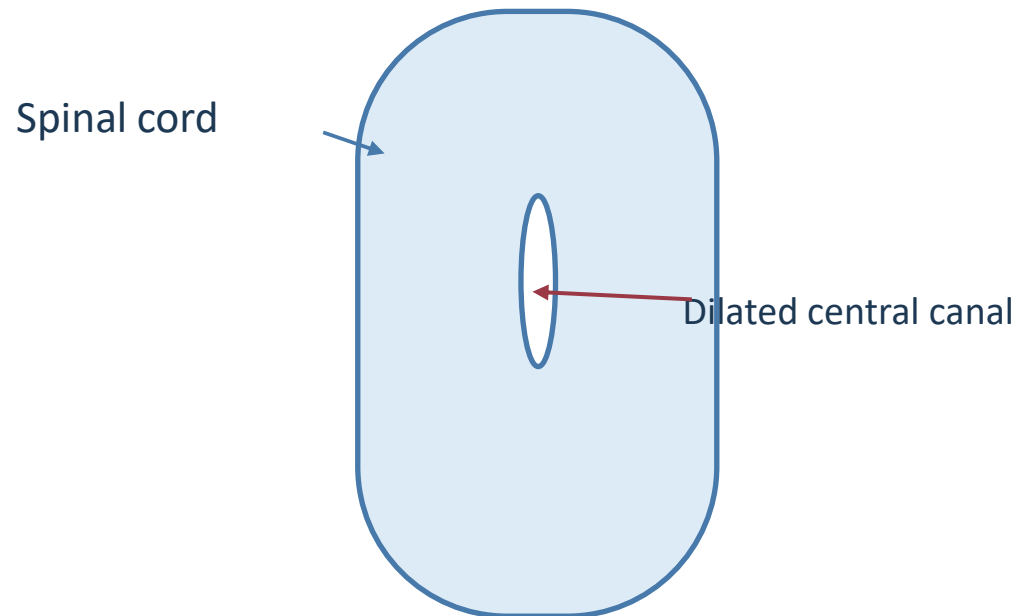
Cord cross-section — schematic

Anterior commissural injury produces a selective sensory pattern.

The relationship between Chiari and syrinx is associative

- Syringomyelia as potentially associated with a Chiari malformation.
- Other causes include intraspinal tumors and prior traumatic injury.
- A syrinx therefore does not by itself prove an underlying Chiari anomaly.

Anatomical schematic — not diagnostic imaging



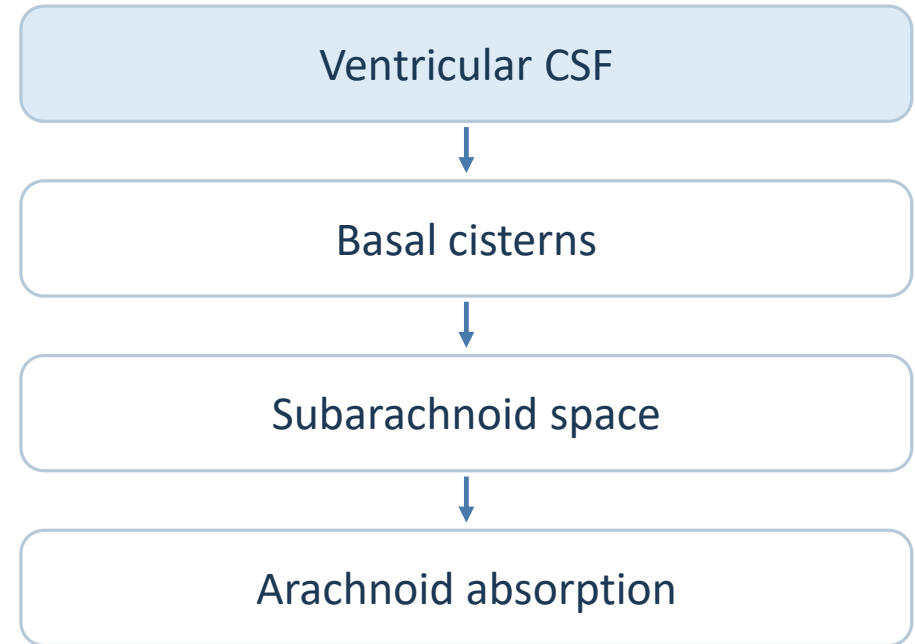
Cord cross-section — schematic

Avoid reverse inference from a nonspecific spinal cord cavity.

CSF pathway anatomy explains why obstruction matters

- CSF is produced by the ventricular choroid plexus.
- It circulates through ventricles to basal cisterns, then subarachnoid space.
- Impaired flow or resorption can expand the ventricular system.

Anatomical schematic — not diagnostic imaging

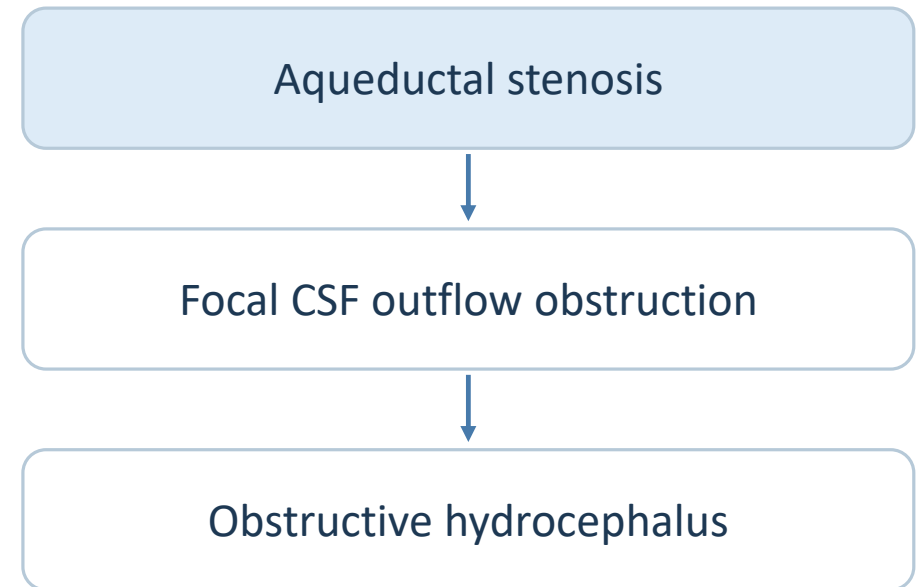


Follow the CSF pathway when interpreting hydrocephalus.

Obstructive hydrocephalus: Where continuity is lost

- Aqueductal stenosis can create focal ventricular obstruction.
- This is termed noncommunicating or obstructive hydrocephalus.
- Aqueductal stenosis as an associated Chiari II abnormality.

Anatomical schematic — not diagnostic imaging



Keep anatomical obstruction distinct from the general diagnosis.

Recognize lesions by their dominant location

Main anatomical clue	Best matching anomaly
Low tonsils entering cervical canal	Chiari I
Misshapen descended vermis + small fossa	Chiari II
Midline ventricular cyst + enlarged fossa	Dandy–Walker
Peduncular rotation + abnormal brainstem (“molar tooth”)	Joubert spectrum

Tonsils, vermis, ventricle, and peduncles answer different questions.

Recognize lesions by their associated abnormalities

Malformation	Major explicitly stated association
Chiari I	CSF-flow impairment, medullary compression, syrinx; may be silent
Chiari II	Hydrocephalus and lumbar myelomeningocele (almost invariable)
Dandy–Walker	Dysplasia of brainstem nuclei can occur
Joubert-related	Diverse mutations affecting primary cilium components

Associations increase confidence without replacing core morphology.

Case 5: A two-part differential

- A posterior fossa study shows vermian abnormality but no description of fossa size.
- One report emphasizes a large midline fourth-ventricular cyst; Another emphasizes atypical peduncles and brainstem shape.
- Which additional feature differentiates Dandy–Walker from Joubert?

Anatomical schematic — not diagnostic imaging

Interpret the anatomy

What feature is most discriminating?

Use a source-supported pattern, not an assumed threshold.

Identify the discriminating relationship, not simply “vermis abnormal.”

Case 5 reasoning: Identify the signature structure

- An enlarged fossa with expanded, roofless fourth ventricle supports Dandy–Walker.
- Peduncular rotation/apparent elongation plus altered brainstem shape supports Joubert.
- Vermian deficiency alone is not sufficiently specific.

Anatomical schematic — not diagnostic imaging

Editable source-grounded anatomical
schematic

Pattern combinations are more reliable than isolated terms.

Four malformations: Comparative morphology

Feature	Chiari I	Chiari II	Dandy–Walker	Joubert
Dominant finding	Low tonsils	Descended vermis	4th-ventricular cyst	Molar tooth sign
Posterior fossa	Not defining	Small	Enlarged	Not defining
Vermis	Not defining	Misshapen; descended	Absent / rudimentary	Hypoplastic
Key association	Syrinx ± symptoms	Hydrocephalus + myelomeningocele	Brainstem nuclei dysplasia	Primary cilium genes

Use this summary to interpret a previously unseen anatomical description.

Take-home anatomical rules

- Chiari I: Identify the low-lying cerebellar tonsils.
- Chiari II: Identify the small fossa, descended vermis, and major spinal/CSF associations.
- Dandy–Walker: Identify the enlarged fossa and roofless fourth-ventricular cyst.
- Joubert: Identify the combined molar tooth configuration and ciliopathy link.

Anatomical schematic — not diagnostic imaging

Chiari I

Low tonsils

Chiari II

Small fossa; Descended
vermis

Dandy–Walker

Expanded 4th-ventricular cyst

Joubert

Molar tooth configuration

Anatomy first; Associated findings second; Inference last.

Primary reference and source boundaries

- Robbins, Cotran & Kumar: Pathologic Basis of Disease, 11th edition (2026), Chapter 28, pp. 1132–1136.
- Main section: “Posterior Fossa Anomalies” (p. 1135).
- Context: hydrocephalus, neural tube malformations, syringomyelia and hydromyelia.
- Original editable schematics are explanatory and are not reproduced textbook figures or diagnostic images.

No original chapter PDF or licensed Fig. 28.8 was available for figure verification.