**Meningiomas** are [extra-axial tumors](https://radiopaedia.org/articles/extra-axial-1?lang=us) and represent the most common [tumor of the meninges](https://radiopaedia.org/articles/tumours-of-the-meninges-differential?lang=us). They are a non-glial neoplasm that originates from the meningocytes or arachnoid cap cells of the [meninges](https://radiopaedia.org/articles/meninges?lang=us) and are located anywhere that meninges are found and in some places where only rest cells are presumed to be located.

Although they are usually easily diagnosed and are typically indolent with a low rate of recurrence following surgery, there are 15 subtypes with variable imaging features and, in some instances, more aggressive biological behavior and higher grades.

Typical meningiomas appear as [dural-based masses](https://radiopaedia.org/articles/dural-masses?lang=us) isointense to grey matter on both T1 and T2 weighted imaging, enhancing vividly on both MRI and CT. Some of the subtypes can vary dramatically in their imaging appearance.

This article is a general discussion of meningioma, focussing on typical primary intradural meningiomas and the imaging findings of intracranial disease.

[Spinal meningioma](https://radiopaedia.org/articles/spinal-meningioma?lang=us) and [primary extradural meningioma](https://radiopaedia.org/articles/extracranial-meningioma?lang=us) as well as some of the various subtypes are discussed separately.

**Terminology**

When describing meningiomas, a variety of terms can be used to more accurately describe these common tumors.

Most commonly they are either classified according to the histological subtype (e.g. rhabdoid or papillary etc.), location (e.g. skull base, spinal, intraosseous, intraventricular, etc.), and by etiology (e.g. radiation-induced, etc.).

A broad division of meningiomas into primary intradural (which may or may not have a secondary extradural extension) and primary extradural is also used, although the latter is rare accounting for only 1-2% of cases 25. [Ectopic primary meningiomas](https://radiopaedia.org/articles/ectopic-meningioma?lang=us) include tumors residing in the head and neck, [orbit](https://radiopaedia.org/articles/orbit?lang=us), nose, paranasal sinus, oropharynx and even more remotely (e.g. lung).

**Epidemiology**

Meningiomas are more common in women, with a ratio of 2:1 intracranially and 4:1 in the spine. Atypical and malignant meningiomas are slightly more common in males. They are uncommon in patients before the age of 40 and should raise suspicion of [neurofibromatosis type 2](https://radiopaedia.org/articles/neurofibromatosis-type-2-3?lang=us) when found in young patients.

**Clinical presentation**

Many small meningiomas are found incidentally and are entirely asymptomatic. Often they cause concern as they are mistakenly deemed to be the cause of vague symptoms, most frequently headaches. Larger tumors or those with adjacent edema or abutting particularly sensitive structures can present with a variety of symptoms. Most common presentations include 8:

* headache: 36%
* paresis: 22%
* change in mental status: 21%

Meningiomas may also become clinically apparent due to mass effect depending on their location:

* supratentorial: 85-90% 8
  + parasagittal, convexities: 45%
    - seizures and hemiparesis
  + [sphenoid ridge](https://radiopaedia.org/articles/sphenoidal-ridge?lang=us): 15-20%
  + [olfactory groove](https://radiopaedia.org/articles/olfactory-groove?lang=us)/[planum sphenoidale](https://radiopaedia.org/articles/planum-sphenoidale?lang=us): 10%
    - [anosmia](https://radiopaedia.org/articles/anosmia?lang=us) (usually not recognized)
    - [Foster Kennedy syndrome](https://radiopaedia.org/articles/foster-kennedy-syndrome?lang=us)
  + juxtasellar: 5-10%
    - visual field defects
    - cranial nerve deficits
* infratentorial: 5-10%
  + [obstructive hydrocephalus](https://radiopaedia.org/articles/obstructive-hydrocephalus?lang=us)
  + cranial nerve deficits
* miscellaneous intradural: <5%
  + [intraventricular meningioma](https://radiopaedia.org/articles/intraventricular-meningioma?lang=us)
  + [optic nerve meningioma](https://radiopaedia.org/articles/optic-nerve-sheath-meningioma?lang=us)
  + pineal gland
    - [Parinaud syndrome](https://radiopaedia.org/articles/parinaud-syndrome?lang=us)
    - [obstructive hydrocephalus](https://radiopaedia.org/articles/obstructive-hydrocephalus?lang=us)

Occasionally transosseous or [intraosseous](https://radiopaedia.org/articles/intraosseous-meningioma?lang=us) involvement with prominent hyperostosis may result in local mass effect (e.g. [proptosis](https://radiopaedia.org/articles/proptosis-1?lang=us)).

Although dural venous sinus invasion and occlusion does occur, it usually occurs very gradually. Therefore most cases of venous invasion are asymptomatic as collateral veins have had time to enlarge.

**Pathology**

Meningiomas are thought to arise from meningocytes or arachnoid cap cells, which themselves arise from pluripotent mesenchymal progenitor cells, which accounts for the unusual location of [primary extradural](https://radiopaedia.org/articles/extracranial-meningioma?lang=us) tumors 17,18.

Although the majority of tumors are sporadic, they are also seen in the setting of previous cranial irradiation and of course in patients with [neurofibromatosis type 2](https://radiopaedia.org/articles/neurofibromatosis-type-2-3?lang=us) (Merlin gene on Chromosome 22). Additionally, meningiomas demonstrate estrogen and progesterone sensitivity and may grow during pregnancy.

**Subtypes**

In the 5th Edition (2021) [WHO classification of CNS tumors](https://radiopaedia.org/articles/who-classification-of-cns-tumours-1?lang=us) a total of 15 subtypes of meningioma are recognized.

* [angiomatous meningioma](https://radiopaedia.org/articles/angiomatous-meningioma?lang=us)
* [atypical meningioma](https://radiopaedia.org/articles/atypical-meningioma?lang=us): grade 2
* [anaplastic (malignant) meningioma](https://radiopaedia.org/articles/meningioma?lang=us): grade 3
* [chordoid meningioma](https://radiopaedia.org/articles/chordoid-meningioma?lang=us): grade 2
* [clear cell meningioma](https://radiopaedia.org/articles/clear-cell-meningioma?lang=us): grade 2
* [fibrous meningioma](https://radiopaedia.org/articles/fibrous-meningioma?lang=us) (7%)
* [lymphoplasmacytic-rich meningioma](https://radiopaedia.org/articles/lymphoplasmacyte-rich-meningioma-2?lang=us)
* [meningothelial meningioma](https://radiopaedia.org/articles/meningothelial-meningioma?lang=us) (17%)
* [metaplastic meningioma](https://radiopaedia.org/articles/metaplastic-meningioma?lang=us)
* [microcystic meningioma](https://radiopaedia.org/articles/microcystic-meningioma?lang=us)
* [papillary meningioma](https://radiopaedia.org/articles/papillary-meningioma?lang=us): usually more aggressive behavior
* [psammomatous meningioma](https://radiopaedia.org/articles/psammomatous-meningioma?lang=us)
* [rhabdoid meningioma](https://radiopaedia.org/articles/rhabdoid-meningioma-1?lang=us): usually more aggressive behavior
* [secretory meningioma](https://radiopaedia.org/articles/secretory-meningioma?lang=us)
* ​[transitional meningioma](https://radiopaedia.org/articles/transitional-meningioma?lang=us) (40%): mixed histology, typically containing meningothelial and fibrous components

**Grading**

Unlike other tumors, the term "atypical" and "anaplastic"/"malignant" have been retained as histological subtypes with grade 2 and grade 3 tumors respectively 31.

Otherwise, meningiomas are graded from grade 1 to 3 based on histological features (e.g. mitotic index) some histological subtypes (e.g. chordoid meningiomas and clear cell meningiomas) and molecular features (see below) 7,11,21,31.

An important change in the 5th Edition (2021) [WHO classification of CNS tumors](https://radiopaedia.org/articles/who-classification-of-cns-tumours-1?lang=us) is that the identification of some histological subtypes (e.g. papillary meningiomas and rhabdoid meningiomas) no longer is sufficient to denote a higher grade 31.

**Grade 2 criteria**

* increased mitotic figures: 4 to 19 in 10 consecutive high power fields (HPF)
* brain invasion (see below)
* chordoid or clear cell histological subtype
* three or more of the following:
  + increased cellularity
  + prominent nucleoli
  + necrosis
  + sheet-like growth
  + small cells with high nuclear to cytoplasmic ratio

**Grade 3 criteria**

* increased mitotic figures: ≥20 in 10 consecutive high power fields (HPF)
* homozygous deletion of CDKN2A/B
* sarcoma or carcinoma or melanoma-like appearance
* TERT promoter mutation

**Brain invasion**

Brain invasion as a stand-alone feature remains controversial. In prior editions of the WHO classification (e.g. 2016) if a meningioma (regardless of histology) demonstrated any brain invasion it was designated as grade 2 as it was believed to denote a poorer prognosis with a higher likelihood of recurrence 7. In many instances, growth is actually along perivascular spaces rather than truly into the brain parenchyma. The 5th Edition has backed away from this dogmatic recommendation recognizing the difficulty in assessing this in some instances 31,32.  Nonetheless, overt brain invasion remains sufficient to denote a grade 2 tumor.

**Macroscopic features**

In general, there are two main macroscopic forms easily recognized in imaging studies:

* globose: rounded, well defined dural masses, likened to the appearance of a fried egg seen in profile (the most common presentation)
* [en plaque](https://radiopaedia.org/articles/en-plaque-meningioma?lang=us): extensive regions of dural thickening

The cut surface reflects the various histologies encountered, ranging from very soft to extremely firm in fibrous or calcified tumors. They are usually light tan in coloring, although again this will depend on histological subtypes.

**Molecular markers**

Increasingly molecular markers are being incorporated into the diagnosis and grading of meningioma subtypes 31.

* SMARCE1 mutations: clear cell subtype
* BAP1 mutations: papillary and rhabdoid subtypes
* KLF4/TRAF7 mutations: secretory subtype
* TERT promoter mutation: grade 3
* homozygous deletion of CDKN2A/B: grade 3
* H3K27me3 loss of nuclear expression: worse prognosis
* methylome profiling: prognostic subtyping

**Radiographic features**

Meningiomas are best imaged with MRI with contrast as this most accurately delineates the tumor, presence of intra- and trans-osseous extension and relationship to the underlying brain. CT, however, is useful if bony anatomy is required (e.g. at the base of skull), when patients cannot have MRI, and especially when the meningioma is entirely ossified/calcified (see [burnt-out meningioma](https://radiopaedia.org/articles/burnt-out-meningioma?lang=us)).

Note that in addition to histological variants, many of which have less-typical imaging appearances, a number of 'special examples' of meningiomas are best discussed separately. These include:

* [burnt-out meningioma](https://radiopaedia.org/articles/burnt-out-meningioma?lang=us)
* [cystic meningiomas](https://radiopaedia.org/articles/cystic-meningioma?lang=us)
* [intraosseous meningioma](https://radiopaedia.org/articles/intraosseous-meningioma?lang=us)
* [intraventricular meningioma](https://radiopaedia.org/articles/intraventricular-meningioma?lang=us)
* [optic nerve sheath meningioma](https://radiopaedia.org/articles/optic-nerve-sheath-meningioma?lang=us)
* [radiation-induced meningioma](https://radiopaedia.org/articles/radiation-induced-meningiomas?lang=us)

The remainder of this section focuses on more typical imaging appearances of run-of-the-mill meningiomas.

**Plain radiograph**

Plain films no longer have a role in the diagnosis or management of meningiomas. Historically a number of features were observed, including:

* enlarged meningeal artery grooves
* hyperostosis or lytic regions
* calcification
* displacement of calcified pineal gland/choroid plexus due to mass effect

**CT**

CT is often the first modality employed to investigate neurological signs or symptoms, and often is the modality which detects an incidental lesion:

* non-contrast CT
  + 60% slightly hyperdense to normal brain, the rest are more isodense
  + 20-30% have some calcification 8
  + >50% demonstrate variable adjacent edema (see below) 22
* post-contrast CT
  + 72% brightly and homogeneously contrast enhance 8
  + malignant or cystic variants demonstrate more heterogeneity/less intense enhancement
* [hyperostosis](https://radiopaedia.org/articles/hyperostosis-of-the-skull-differential?lang=us) (5%) 21
  + typical for meningiomas that abut the base of the skull
  + need to distinguish reactive hyperostosis from:
    - direct skull vault invasion by adjacent meningioma
    - [primary intraosseous meningioma](https://radiopaedia.org/articles/intraosseous-meningioma?lang=us)
* enlargement of the paranasal sinuses ([pneumosinus dilatans](https://radiopaedia.org/articles/pneumosinus-dilatans?lang=us)) has also been suggested to be associated with anterior cranial fossa meningiomas 19
* lytic/destructive regions are seen particularly in higher grade tumors but should make one suspect alternative pathology (e.g. [hemangiopericytoma](https://radiopaedia.org/articles/meningeal-haemangiopericytoma-historical?lang=us) or metastasis) ref

**MRI**

As is the case with most other intracranial pathology, MRI is the investigation of choice for the diagnosis and characterization of meningiomas. When appearance and location are typical, the diagnosis can be made with a very high degree of certainty. In some instances, however, the appearances are atypical and careful interpretation is needed to make a correct preoperative diagnosis.

Meningiomas typically appear as extra-axial masses with a broad dural base. They are usually homogeneous and well-circumscribed, although many variants are encountered. It seems that the signal intensity of meningiomas on T2-weighted images correlates with the histological subtypes 27.

**Signal characteristics**

Signal characteristics of typical meningiomas include:

* **T1**
  + usually isointense to grey matter (60-90%) 3,8,13
  + hypointense to grey matter (10-40%): particularly [fibrous](https://radiopaedia.org/articles/fibrous-meningioma?lang=us), [psammomatous](https://radiopaedia.org/articles/psammomatous-meningioma?lang=us) variants
* **T1 C+ (Gd)**: usually intense and homogeneous enhancement
* **T2**
  + usually isointense to grey matter (~50%) 3,8,13
  + hyperintense to grey matter (35-40%)
    - usually correlates with a soft texture and hypervascular tumors 13
    - seen in [microcystic](https://radiopaedia.org/articles/microcystic-meningioma?lang=us), [secretory](https://radiopaedia.org/articles/secretory-meningioma?lang=us), [cartilaginous](https://radiopaedia.org/articles/cartilaginous-meningioma?lang=us) (metaplastic), [chordoid](https://radiopaedia.org/articles/chordoid-meningioma?lang=us) and [angiomatous](https://radiopaedia.org/articles/angiomatous-meningioma?lang=us) variants 12
  + hypointense to grey matter (10-15%): compared to grey matter and usually correlates with harder texture and more fibrous and calcified contents
* **DWI/ADC**: grade 2 and 3 tumors may show greater than expected restricted diffusion although this is not universally useful in prospectively predicting histological grade 14,15
* **MR spectroscopy**:usually does not play a significant role in diagnosis but can help distinguish meningiomas from mimics. Features include:
  + increase in [alanine](https://radiopaedia.org/articles/alanine-peak?lang=us) (1.3-1.5 ppm)
  + increased [glutamine/glutamate](https://radiopaedia.org/articles/glutamine-glutamate-peak?lang=us)
  + increased [choline](https://radiopaedia.org/articles/choline-peak?lang=us) (Cho): cellular tumor
  + absent or significantly reduced [N-acetylaspartate](https://radiopaedia.org/articles/n-acetylaspartate-naa-peak?lang=us) (NAA): non-neuronal origin
  + absent or significantly reduced [creatine](https://radiopaedia.org/articles/creatine-peak?lang=us) (Cr)
* **MR perfusion**:good correlation between [volume transfer constant (k-trans)](https://radiopaedia.org/articles/missing?article%5Btitle%5D=volume-transfer-constant-k-trans&lang=us) and histological grade 26
* **MR tractography**: allows the identification of white matter tracts adjacent to the meningioma
  + this may aid in preoperative planning for meningioma resection by allowing planning of a safer access route that would result in less residual functional iatrogenic deficits​ 28

**Helpful imaging signs**

A number of helpful imaging signs have been described, including:

* [CSF cleft sign](https://radiopaedia.org/articles/cleft-sign?lang=us), which is not specific for meningioma, but helps establish the mass to be extra-axial; loss of this can be seen in grade II and grade III which may suggest brain parenchyma invasion
* [dural tail](https://radiopaedia.org/articles/dural-tail-sign-1?lang=us) is seen in 60-72% 2 (note that a dural tail is also seen in other processes)
* [sunburst](https://radiopaedia.org/articles/sunburst-sign-meningioma-1?lang=us) or [spoke-wheel](https://radiopaedia.org/articles/spoke-wheel-sign-meningioma-1?lang=us) appearance of the vessels
* [white matter buckling sign](https://radiopaedia.org/articles/white-matter-buckling-sign-1?lang=us)
* arterial narrowing
  + typically seen in meningiomas which encase arteries
  + useful sign in parasellar tumors, in distinguishing a meningioma from a [pituitary macroadenoma](https://radiopaedia.org/articles/pituitary-macroadenoma?lang=us); the latter typically does not narrow vessels
* peripheral rim of enhancement between meningioma and brain parenchima in post-contrast 3D-FLAIR can help in distinguishing meningioma from other dural based tumor35

**Edema**

More than half of the meningiomas demonstrate a variable amount of vasogenic edema in adjacent brain parenchyma 22. Correlation between age, gender, tumor size, rapid growth, location (convexity and parasagittal > elsewhere), histologic type, and invasion in the case of [malignant meningiomas](https://radiopaedia.org/articles/malignant-meningiomas?lang=us) have been suggested in literature but not yet confirmed. Although in general, the presence of severe adjacent edema is considered more compatible with aggressive meningiomas, in some histologically benign types such as [secretory type](https://radiopaedia.org/articles/secretory-meningioma?lang=us), edema can be disproportionately larger than the small tumor size.

The underlying mechanism is most likely multifactorial however it has been shown that there is a strong association between the presence and severity of the peritumoral vasogenic edema (i.e. [edema index](https://radiopaedia.org/articles/missing?article%5Btitle%5D=oedema-index&lang=us)) and expression of the vascular endothelial growth factor (VEGF) or expression of CEA and CK 16,23.

List of some of the proposed underlying mechanisms are:

* venous stasis/occlusion/thrombosis
* compressive ischemia
* aggressive growth/invasion
* parasitization of pial vessels
* histologic subtype: [secretory meningioma](https://radiopaedia.org/articles/secretory-meningioma?lang=us) 23
* vascular endothelial growth factor (VEGF): produced within the meningioma that enters the adjacent parenchyma
* expression of CEA and CK

**Angiography (DSA)**

Catheter angiography is rarely now of diagnostic use but rather is performed for preoperative embolization to reduce intraoperative blood loss and alleviate resection of a tumor. This is especially useful for skull base tumors, or those thought to be particularly vascular (e.g. [microcystic variants](https://radiopaedia.org/articles/microcystic-meningioma?lang=us) or those with very large vessels). Particles are favored typically 7-9 days prior to surgery although they are not free of complication, particularly one study showed a high prevalence of complications associated with particles smaller than 45-150 μm, so risks and benefits should be thoroughly assessed 24.

Meningiomas can have a dual blood supply. The majority of tumors are predominantly supplied by meningeal vessels; these are responsible for the [sunburst](https://radiopaedia.org/articles/sunburst-sign-meningioma-1?lang=us) or [spoke-wheel](https://radiopaedia.org/articles/spoke-wheel-sign-meningioma-1?lang=us)pattern observed on MRI/DSA. Some tumors also have a significant pial supply to the periphery of a tumor.

A well known angiographic sign of meningiomas is the [mother-in-law sign](https://radiopaedia.org/articles/mother-in-law-sign?lang=us), in which the tumor contrast blush "comes early, stays late, and is very dense".

**Treatment and prognosis**

Treatment is usually with surgical excision. If only incomplete resection is possible (especially at the base of the skull) then external-beam radiation therapy (or even [brachytherapy](https://radiopaedia.org/articles/brachytherapy?lang=us)) can be used 8,29. Radiation has been shown to improve local control and prolongs overall survival 33.

No widespread chemotherapeutic/systemic therapy has been proven to be efficacious although some mTOR inhibitor and antiangiogenic treatments show promise 35.

The [Simpson grade](https://radiopaedia.org/articles/simpson-grade-of-meningioma-resection?lang=us) correlates the degree of surgical resection completeness with symptomatic recurrence rate which also varies with grade and length of follow-up 8,20. Metastatic disease is rare but has been reported 8.

**History and etymology**

The term "meningioma" was first introduced by **Harvey Cushing**, a renowned American neurosurgeon, in 1922 9,22.

**Differential diagnosis**

The differential diagnosis generally includes other dural masses as well as some location-specific entities.

The main dural masses to consider include:

* [solitary fibrous tumors of the dura](https://radiopaedia.org/articles/solitary-fibrous-tumour-of-the-dura?lang=us)
  + more aggressive often destroying bone
  + extensive peripheral vascularity
  + more microlobulation
* [dural metastases](https://radiopaedia.org/articles/dural-metastases?lang=us) (e.g. breast cancer)
* for other less common differentials see [dural masses](https://radiopaedia.org/articles/dural-masses?lang=us)

Specific location differentials include:

* [cerebellopontine angle](https://radiopaedia.org/articles/cerebellopontine-angle-cistern?lang=us)
  + [acoustic schwannoma](https://radiopaedia.org/articles/vestibular-schwannoma?lang=us)
* [pituitary region](https://radiopaedia.org/articles/pituitary-region-masses?lang=us)
  + [pituitary macroadenoma](https://radiopaedia.org/articles/pituitary-macroadenoma?lang=us)
  + [craniopharyngioma](https://radiopaedia.org/articles/craniopharyngioma-historical?lang=us)
* base of the skull
  + [hypertrophic pachymeningitis](https://radiopaedia.org/articles/hypertrophic-pachymeningitis?lang=us)
  + [extramedullary hematopoiesis](https://radiopaedia.org/articles/extramedullary-haematopoiesis?lang=us)
  + [chondrosarcoma](https://radiopaedia.org/articles/chondrosarcoma-of-the-skull-base?lang=us)
  + [chordoma](https://radiopaedia.org/articles/chordoma?lang=us)

In the setting of [hyperostosis](https://radiopaedia.org/articles/hyperostosis-of-the-skull-differential?lang=us) consider:

* [Paget's disease](https://radiopaedia.org/articles/paget-disease-bone?lang=us)
* [fibrous dysplasia](https://radiopaedia.org/articles/fibrous-dysplasia?lang=us)
* sclerotic metastases (e.g. [prostate](https://radiopaedia.org/articles/prostate?lang=us) and breast carcinoma)

**U MÀNG NÃO (MENINGIOMA)**

U màng não là các khối u ngoài trục và là loại u phổ biến nhất của màng não. Đây là một dạng u không thuộc tế bào thần kinh đệm, có nguồn gốc từ các tế bào màng não hoặc tế bào nắp màng nhện của màng não. Chúng có thể xuất hiện ở bất kỳ vị trí nào có màng não và thậm chí ở một số nơi chỉ có các tế bào còn sót lại.

Mặc dù thường dễ chẩn đoán và có xu hướng phát triển chậm với tỷ lệ tái phát thấp sau phẫu thuật, u màng não có 15 phân nhóm với đặc điểm hình ảnh thay đổi và trong một số trường hợp có hành vi sinh học xâm lấn hơn, có cấp độ cao hơn.

U màng não điển hình xuất hiện dưới dạng các khối u dựa trên màng cứng, có tín hiệu đẳng cường độ với chất xám trên cả ảnh MRI T1 và T2, tăng đậm độ mạnh trên cả MRI và CT. Một số phân nhóm có thể có hình ảnh thay đổi đáng kể.

Bài viết này là một thảo luận tổng quan về u màng não, tập trung vào các u màng não nội màng cứng nguyên phát điển hình và các đặc điểm hình ảnh của bệnh lý nội sọ.

Các u màng não cột sống và u màng não ngoài màng cứng nguyên phát cũng như một số phân nhóm khác sẽ được thảo luận riêng.

**Thuật ngữ**

Khi mô tả u màng não, có thể sử dụng nhiều thuật ngữ khác nhau để mô tả chính xác hơn về loại u phổ biến này.

Chúng thường được phân loại theo:

* **Dưới dạng mô học** (ví dụ: rhabdoid, papillary, v.v.).
* **Vị trí** (ví dụ: nền sọ, cột sống, trong xương, trong não thất, v.v.).
* **Nguyên nhân** (ví dụ: do bức xạ).

Một cách phân loại rộng là chia u màng não thành **nội màng cứng nguyên phát** (có thể có phần mở rộng thứ phát ra ngoài màng cứng) và **ngoài màng cứng nguyên phát**, mặc dù loại sau rất hiếm, chỉ chiếm 1-2% trường hợp.

U màng não lạc chỗ bao gồm các khối u nằm ở vùng đầu và cổ, hốc mắt, mũi, xoang cạnh mũi, họng và thậm chí ở những vị trí xa hơn (ví dụ: phổi).

**Dịch tễ học**

U màng não phổ biến hơn ở phụ nữ với tỷ lệ 2:1 trong sọ và 4:1 ở cột sống. Các dạng không điển hình và ác tính có xu hướng gặp ở nam giới nhiều hơn. Bệnh hiếm gặp ở bệnh nhân dưới 40 tuổi và nếu phát hiện ở người trẻ, nên xem xét khả năng mắc **bệnh u sợi thần kinh loại 2 (NF2)**.

**Biểu hiện lâm sàng**

Nhiều u màng não nhỏ được phát hiện tình cờ và hoàn toàn không có triệu chứng. Chúng thường gây lo ngại vì bị nhầm là nguyên nhân gây ra các triệu chứng mơ hồ, phổ biến nhất là **đau đầu**. Các khối u lớn hơn hoặc có phù nề xung quanh hoặc chèn ép các cấu trúc nhạy cảm có thể gây ra nhiều triệu chứng khác nhau. Các triệu chứng phổ biến nhất bao gồm:

* **Đau đầu**: 36%
* **Yếu cơ (paresis)**: 22%
* **Thay đổi trạng thái tinh thần**: 21%

Tùy vào vị trí, u màng não có thể gây ra các triệu chứng do **hiệu ứng khối**:

* **Trên lều tiểu não (supratentorial)** (85-90%):
  + Vùng cạnh đường giữa (parasagittal, convexity): 45% → có thể gây động kinh, liệt nửa người.
  + Mào bướm (sphenoid ridge): 15-20%.
  + Rãnh khứu giác (olfactory groove/planum sphenoidale): 10% → có thể gây **mất khứu giác**, hội chứng Foster Kennedy.
* **Gần tuyến yên (juxtasellar)** (5-10%): gây **rối loạn thị giác, ảnh hưởng dây thần kinh sọ**.
* **Dưới lều tiểu não (infratentorial)** (5-10%): có thể gây **não úng thủy tắc nghẽn, ảnh hưởng dây thần kinh sọ**.
* **Các vị trí khác** (<5%):
  + U màng não trong não thất.
  + U màng não dây thần kinh thị giác.
  + U tuyến tùng, có thể gây hội chứng Parinaud.

U màng não có thể xâm lấn xương sọ gây **tăng sinh xương (hyperostosis)**, đôi khi dẫn đến **lồi mắt (proptosis)**.

**Bệnh lý**

U màng não có nguồn gốc từ **tế bào màng nhện hoặc tế bào màng não**, phát triển từ **tế bào trung mô đa năng**. Điều này giải thích sự xuất hiện của các u ngoài màng cứng nguyên phát ở những vị trí bất thường.

Đa số các khối u là **tự phát**, nhưng cũng có thể liên quan đến **tiền sử chiếu xạ** hoặc **bệnh u sợi thần kinh loại 2 (NF2 - đột biến gene Merlin trên nhiễm sắc thể 22)**. U màng não cũng có **thụ thể estrogen và progesterone**, có thể phát triển nhanh trong thời kỳ mang thai.

**Phân nhóm u màng não theo WHO 2021**

WHO 2021 công nhận **15 phân nhóm u màng não**, bao gồm:

* **Grade 1** (lành tính): u màng não dạng sợi, màng não, chuyển tiếp, giàu mạch máu, nhiều bạch cầu lympho, biến dạng, vi nang, vôi hóa.
* **Grade 2** (không điển hình): u màng não dạng dây, tế bào trong suốt, chồi, có dấu hiệu xâm lấn não.
* **Grade 3** (ác tính): u màng não dạng tế bào cơ vân, bài tiết, ung thư hóa.

**Đặc điểm hình ảnh**

**MRI** là phương pháp tốt nhất để đánh giá u màng não. CT cũng hữu ích khi cần đánh giá **cấu trúc xương**.

* **T1**: thường **đẳng cường độ** với chất xám.
* **T2**: có thể **đẳng, tăng hoặc giảm tín hiệu**, tùy thuộc vào mô học.
* **Sau tiêm gadolinium (T1 C+ Gd)**: thường **tăng tín hiệu mạnh và đồng nhất**.

**Dấu hiệu hình ảnh quan trọng:**

* **Dấu hiệu "đuôi màng cứng" (dural tail)**: xuất hiện trong 60-72% trường hợp.
* **Dấu hiệu "bánh xe nan hoa" (spoke-wheel sign)**: cho thấy nguồn cấp máu mạnh.
* **Dấu hiệu "rãnh dịch não tủy" (CSF cleft sign)**: giúp xác định khối u nằm ngoài trục.

**Điều trị và tiên lượng**

Phẫu thuật là phương pháp chính. Xạ trị có thể được sử dụng nếu phẫu thuật không loại bỏ hoàn toàn khối u. Tiên lượng tùy thuộc vào **mức độ cắt bỏ (thang Simpson)** và **cấp độ mô học**.