Radiology signs in pulmonary medicine

Less commen

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a practical guide for radiologists and non-radiologists

The chest CT signs described in the present essay can be broadly categorized into

four groups based on anatomical distribution: parenchymal, airway, vascular, and pleural-based signs.

Air Crescent Sign

الهلال الغازي

a complete or partial circumferential **rim** of radiolucent **airspace** within a parenchymal consolidation or nodular **opacity**

It has classically been associated with

invasive aspergillosis

The appearance of this sign may be explained by the **peripheral reabsorption** of the necrotic tissue developed in the central portion:

the residual part is replaced by air

presence of an air crescent **marks the recovery phase** of the disease and portends a favorable prognosis

The air crescent sign can be seen in other conditions such as

pulmonary TB

pulmonary abscess

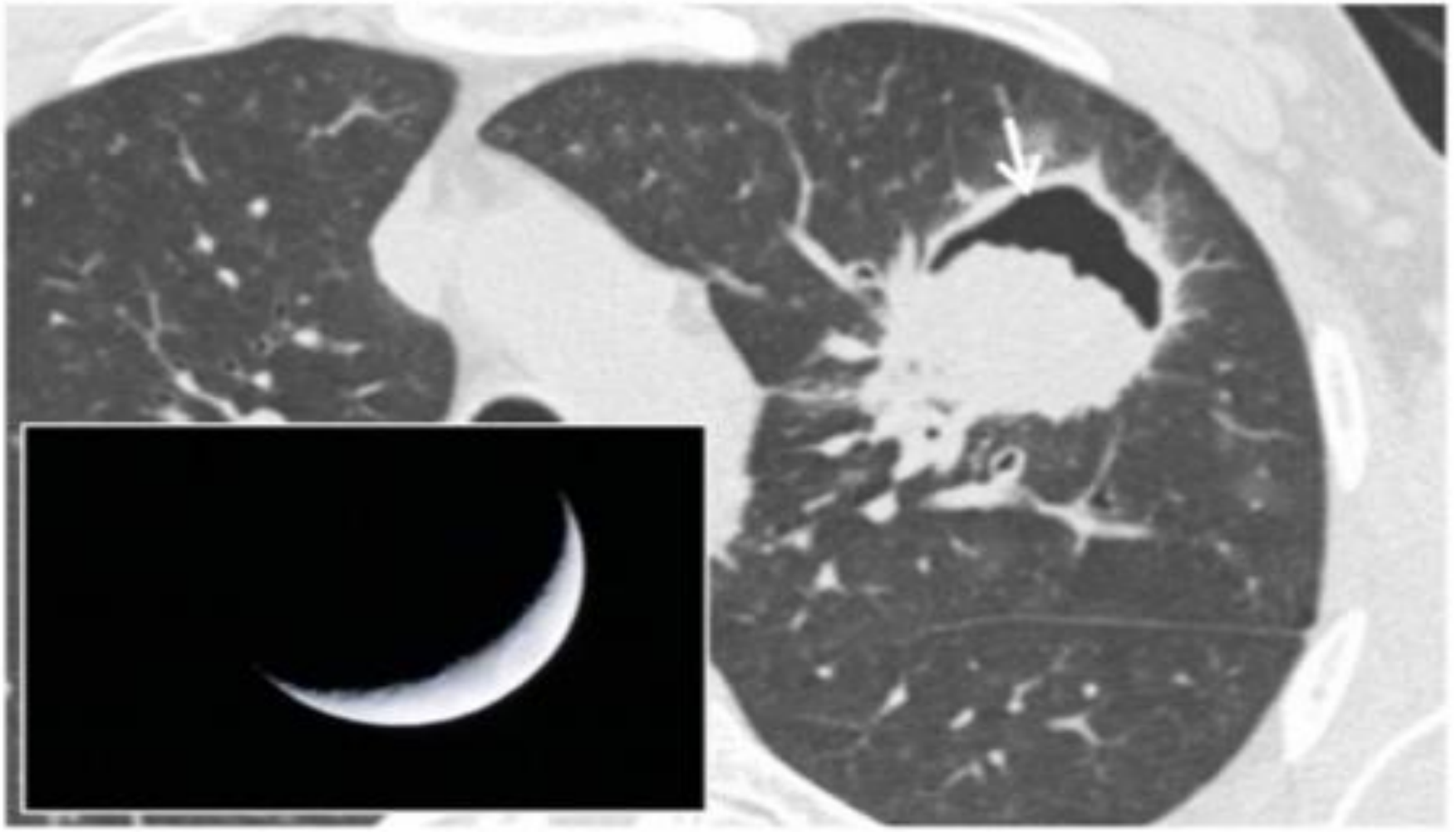
bronchogenic carcinoma

parasitic lesions (hydatidosis)

Air crescent sign.

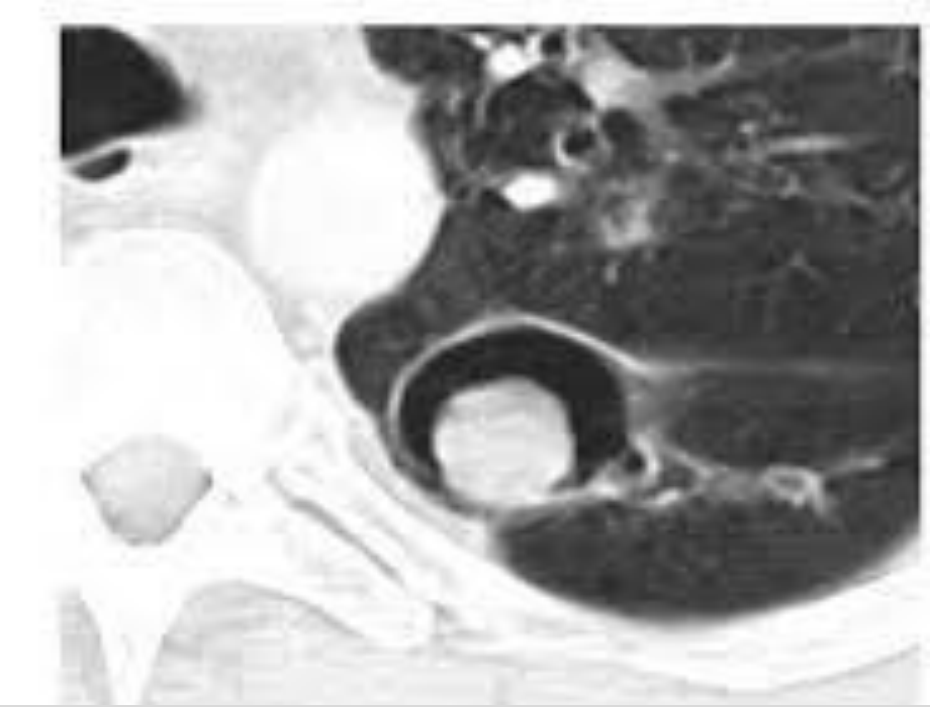
CT scan of a patient with pulmonary aspergillosis showing a necrotic and cavitated lesion (white arrow) in left upper lobe. The air filling the cavitation looks like

the shadow of a crescent moon

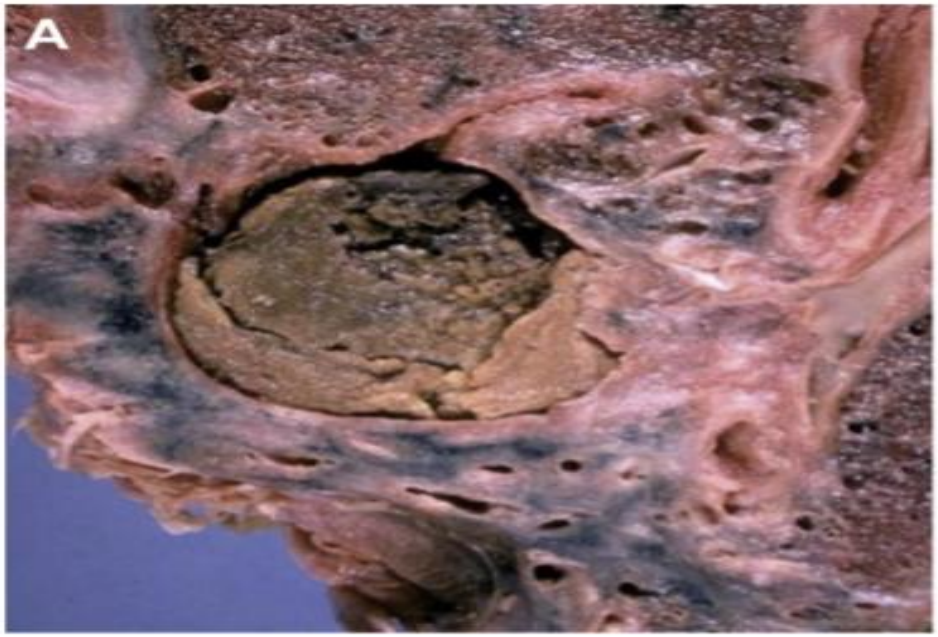


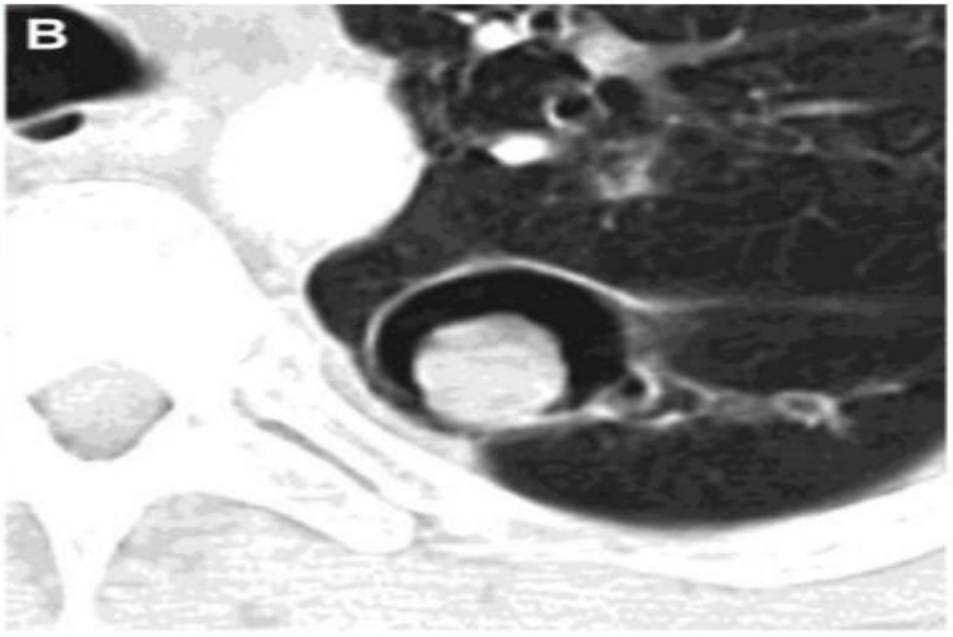
Air crescent sign in a patient with invasive aspergillosis.

Monod Sign



refers to **air** surrounding **a fungal ball** in a preexisting pulmonary cavity.

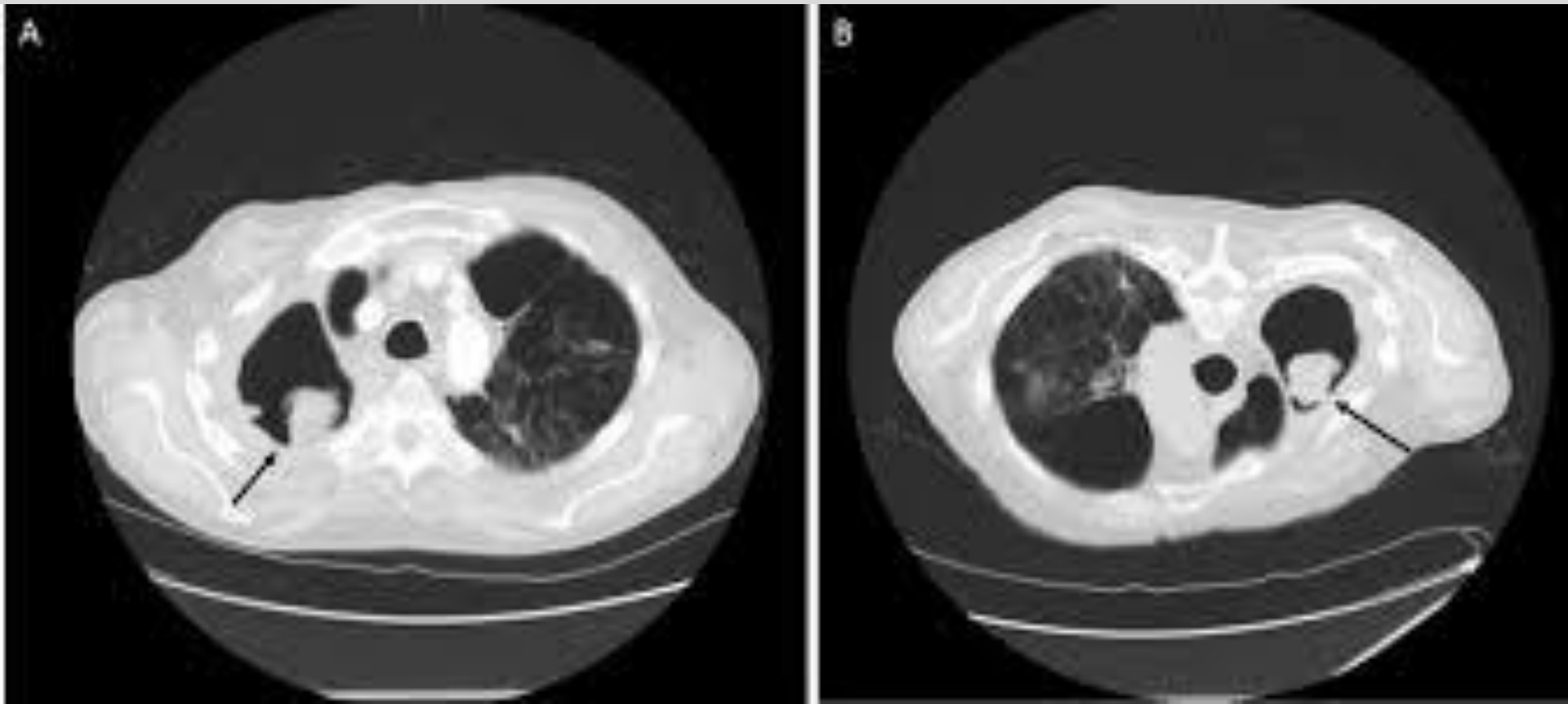




A, Gross pathology specimen showing a cut surface of lung with an **aspergilloma**

B, CT chest axial cuts showing the Monod sign in a case of pulmonary **aspergilloma.**

The ball falls to **a gravity-dependent location** of the cavity



CT scans can be performed in **different positions to elicit mobility** of the mass within the cavity

It is an **important sign** that helps **distinguish** a "mass within a preexisting cavity" such as an **aspergilloma vs a "cavitary mass**

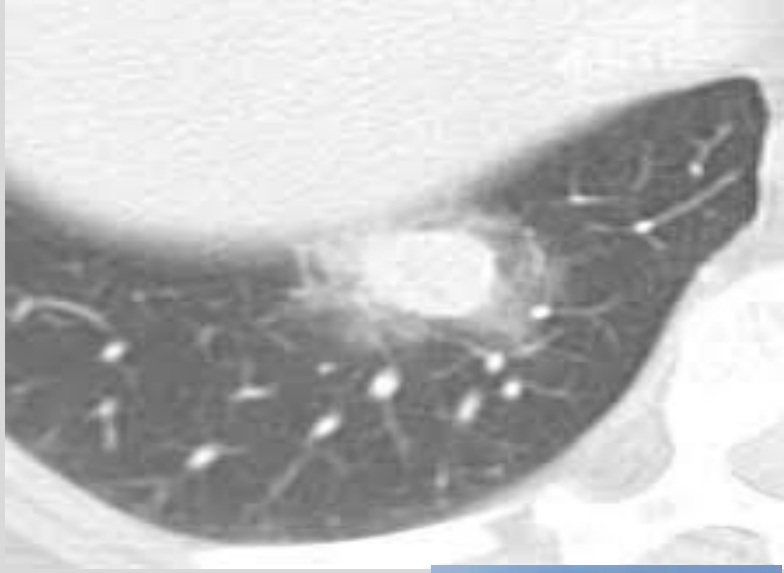
It is used interchangeably, although incorrectly, with the air crescent sign, which is seen in invasive aspergillosis and indicates a favorable prognosis

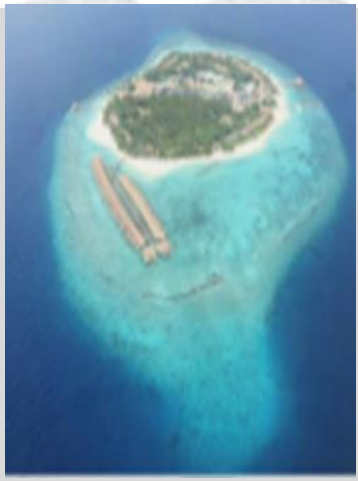
.

Variable	Air Crescent Sign	Monod Sign
Description	Crescentic or circumferential **rim** of radiolucent airspace within a parenchymal consolidation	Air surrounding a fungal **ball** in a preexisting pulmonary cavity
Differential diagnosis	Invasive aspergillosis, bronchogenic carcinoma	Aspergilloma
Mobility of mass	**Non**mobile	**Mobile** mass within the cavity
Positional change	None	Mass gravitates to the dependent areas of the cavity
Patient profile	Usually immunocompromised	Immunocompetent

Halo Sign

الهالة





a **solid** pulmonary nodule surrounded by a circumferential **ground glass** opacity (GGO).

These have classically been described in

angioinvasive fungal infections

such as invasive pulmonary aspergillosis

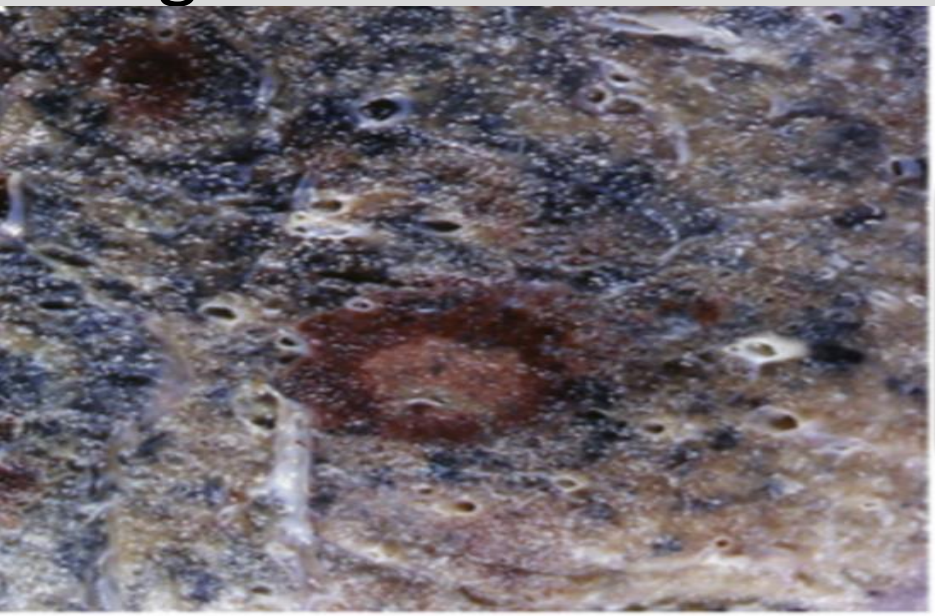
and pulmonary mucormycosis in immunocompromised hosts

Histopathologically:

the **central nodule** represents a focus of **pulmonary infarction**,

the surrounding **GGO** corresponds to areas of **pulmonary hemorrhage**

attributed to the **angioinvasive** nature of the fungus



Gross specimen of lung in a patient with angioinvasive aspergillosis

The incidence of the halo sign among patients with invasive pulmonary aspergillosis is particularly **high** during its **early stages** and

tends to disappear over time

Adenocarcinoma in situ can manifest with the halo sign in immunocompetent

Other noninfectious causes include

granulomatosis with polyangiitis

amyloidosis

sarcoidosis

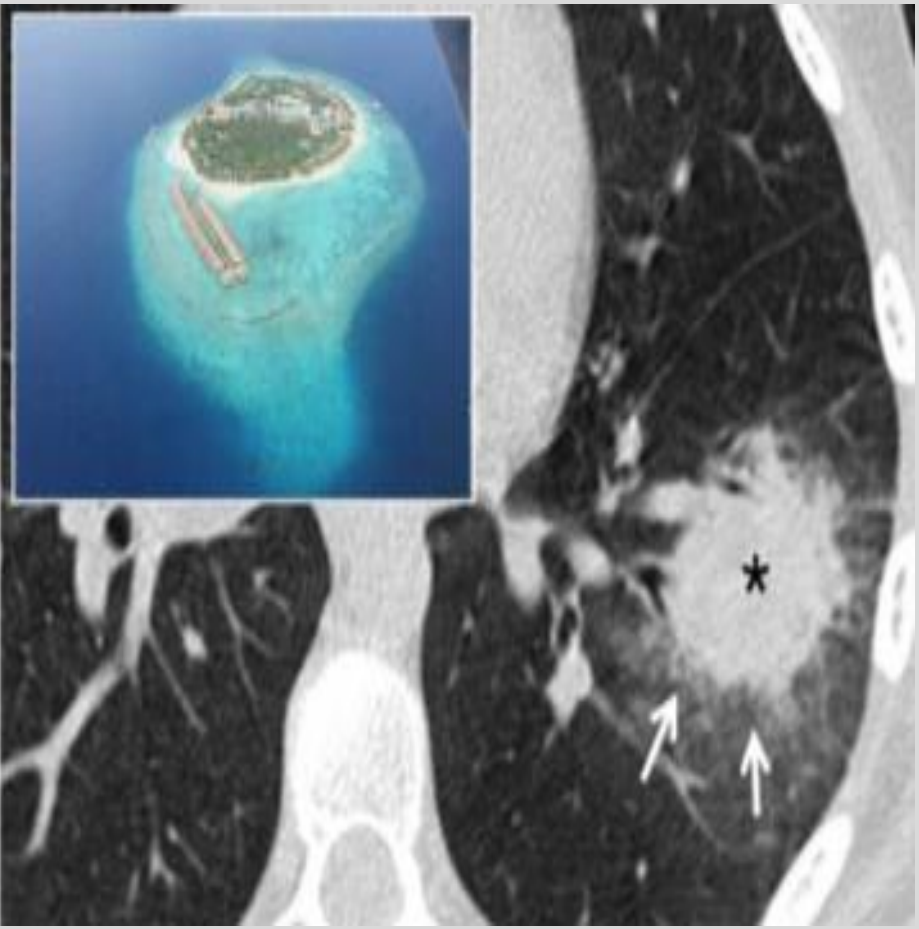
metastatic cancers

organizing pneumonia

pulmonary endometriosis

Halo sign in a patient with **invasive aspergillosis**

Halo sign.



The CT image shows the “halo sign” in a patient with

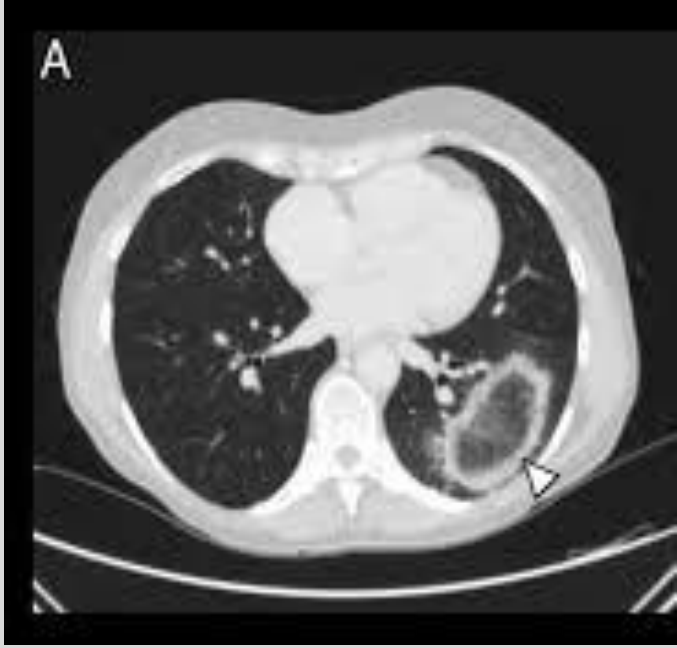
angioinvasive aspergillosis:

in the left lower lobe, it is possible to appreciate a round consolidation (black asterisk) with peripheral ground glass (white arrows), which suggests a hemorrhagic process.

This ring or peripheral ground glass is similar to the sea’s appearance adjacent to an atoll

مظهر البحر حول جزيرة مرجانية

Atoll Sign
(Reverse Halo Sign)
جزيرة مرجانية



characterized by a **central GGO** surrounded by crescentic or circumferential

rim of dense consolidation.

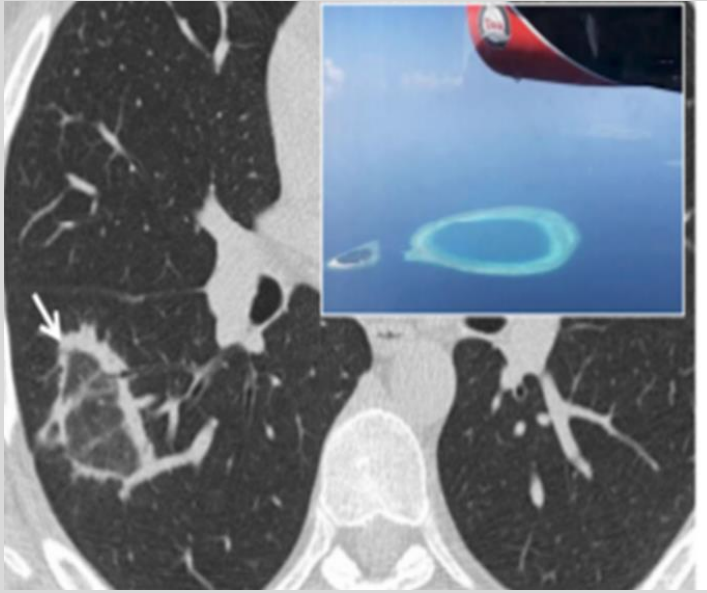
It derives its name due to its similarities to

a coral atoll

A coral atoll in the Maldives

Atoll sign or reverse halo sign in a patient with cryptogenic organizing pneumonia

It has been classically described in **cryptogenic organizing pneumonia** but is **not specific** for the disease



central GGO	• alveolar septal inflammation and cellular **debris**
peripheral consolidation	• **organizing** pneumonia within the alveolar ducts

It can also be seen in a wide range of pulmonary diseases, including

invasive fungal infections

Pneumocystis jirovecii pneumonia (PJP)

lymphomatoid granulomatosis

granulomatosis with polyangiitis

lipoid pneumonia

sarcoidosis

lepidic-predominant **adenocarcinoma** of the lung

ARCADE-LIKE SIGN

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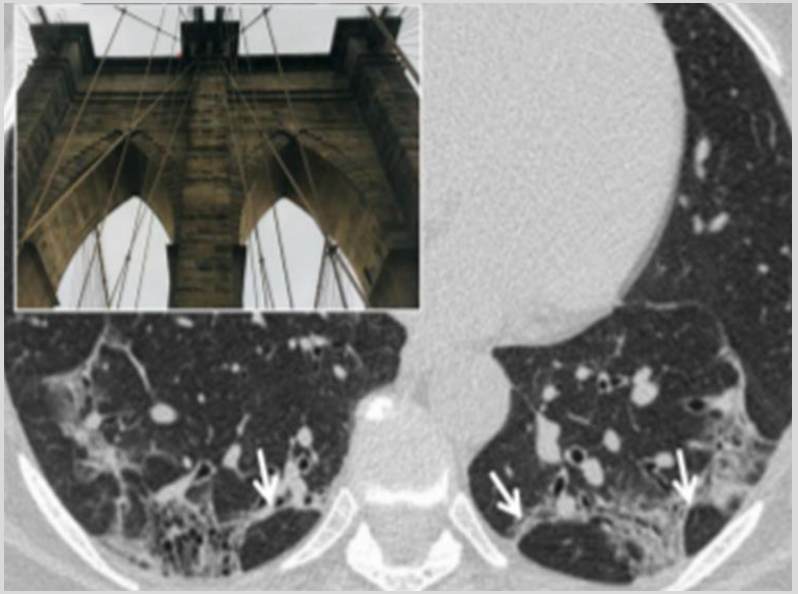
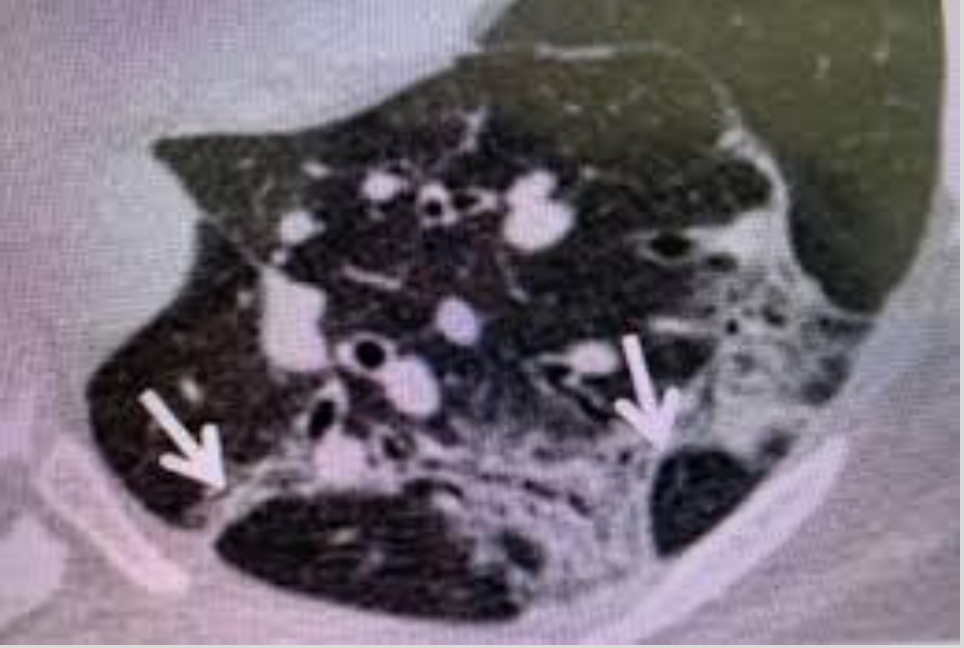


It refers to the typical feature of

perilobular fibrosis and inflammation frequently found in

COP (cryptogenic organizing pneumonia).



found the presence of **perilobular fibrosis**, with an **“arch” pattern**,

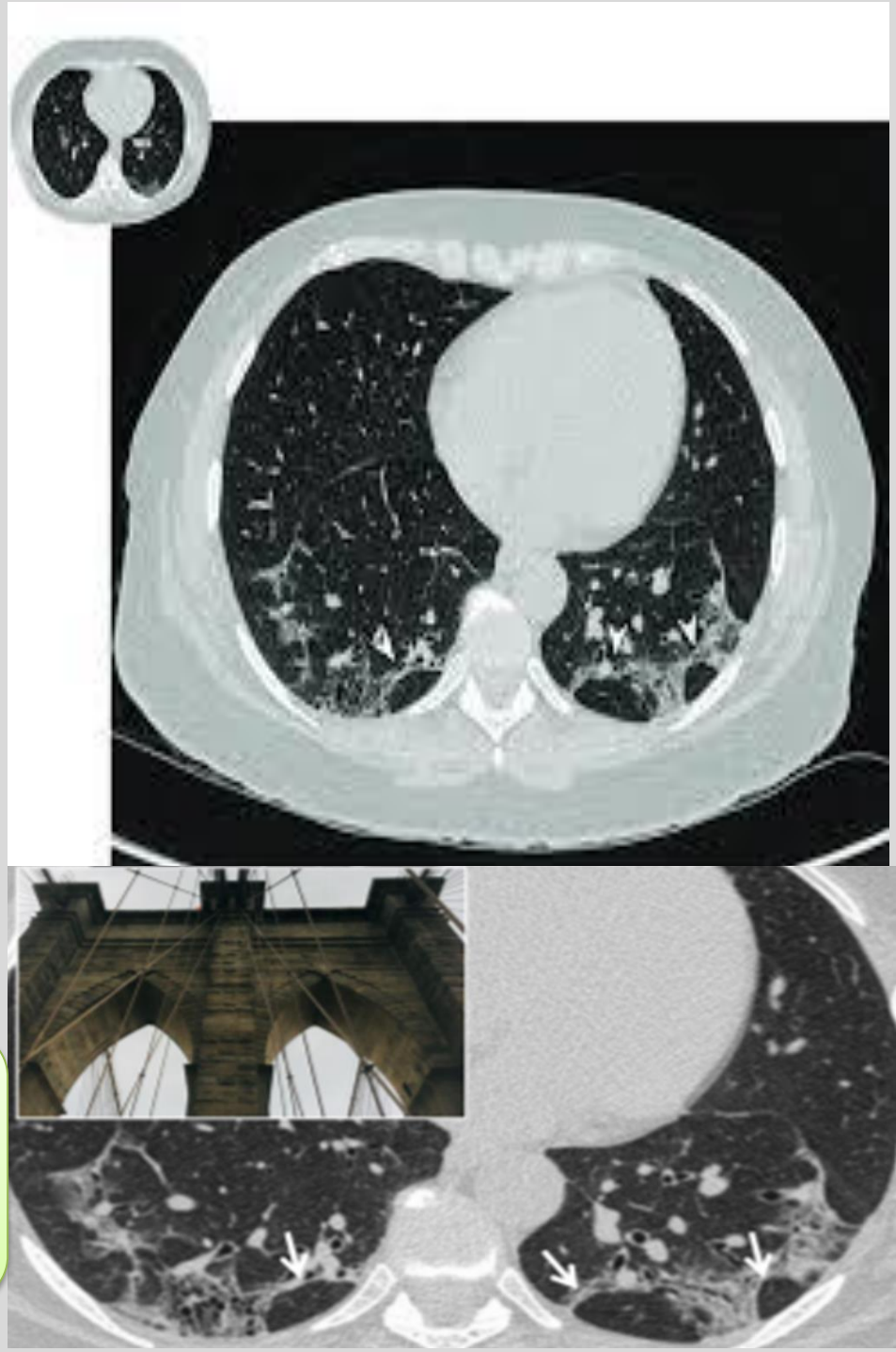
in more **than half** of the patients with COP

It shows itself in the form of **curved or arched consolidation bands**,

with shaded margins, distributed around the structures surrounding the secondary pulmonary lobules

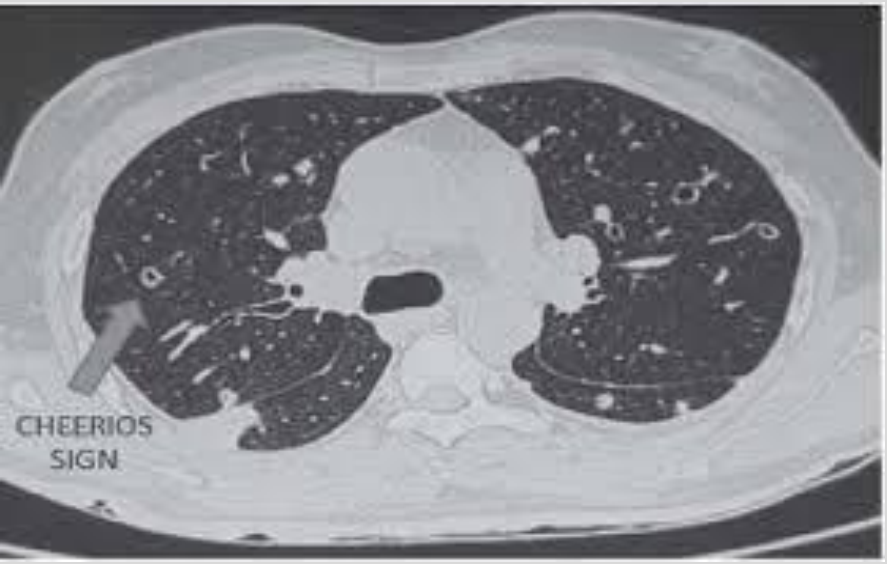
it often reaches the pleural surface

This pattern resembles an arcade appearance



Cheerios Sign

حبوب الفطور

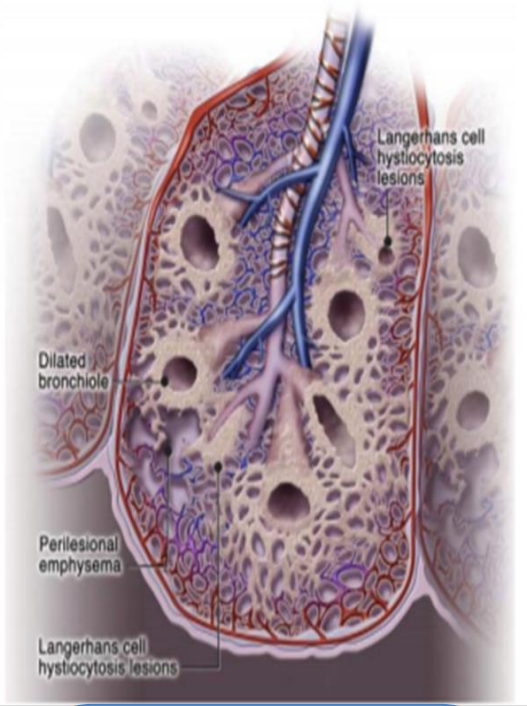


also called the open bronchus sign

is characterized by **a pulmonary nodule** with a **lucency** at its center resembling the Cheerios breakfast cereal (General Mills) .

It occurs due to proliferation of neoplastic or nonneoplastic cells around **a patent airway**, seen in conditions such as lung **adenocarcinoma** and pulmonary **Langerhans cell histiocytosis**

Cheerios breakfast cereal



pulmonary Langerhans cell histiocytosis lesions with proliferation of Langerhans cells around dilated bronchioles, showing the Cheerios sign

The sign was referred to the onset of **low-grade pulmonary adenocarcinomas**.

Histologically, tumors that can reproduce cheerios sign are adenocarcinoma **in situ**, **minimally** invasive adenocarcinoma, invasive adenocarcinoma with a predominantly **lepidic** component, or invasive **mucinous** adenocarcinoma

This sign can also be occasionally seen in cavitary lesions of the lung, such as

fungal infections

primary and **metastatic** lung cancers

lymphoma

rheumatoid nodules

granulomatosis with polyangiitis

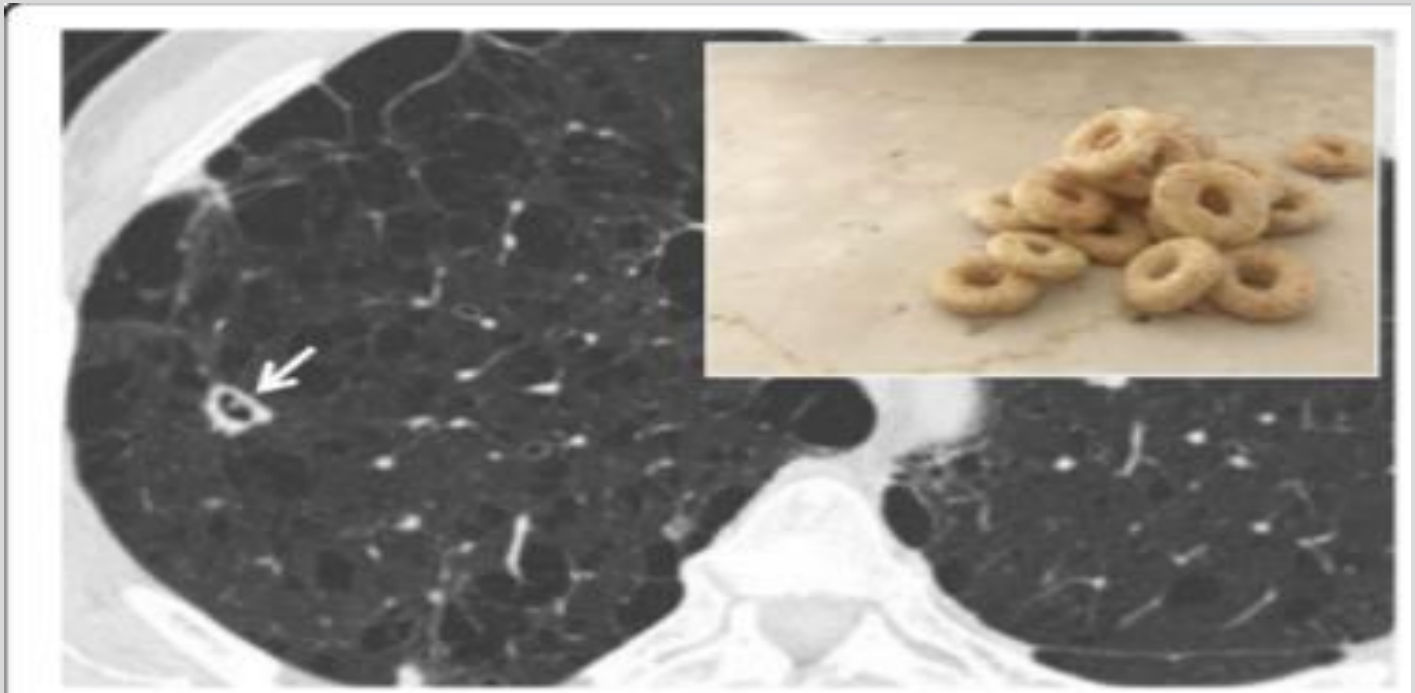
Cheerios sign

seen on chest CT scan in a patient with biopsy proven pulmonary **adenocarcinoma**.

Cheerios sign.

- The cheerios sign is due to cell proliferation around a bronchial branch (white arrow); it may be found in patients with **Langerhans Cell histiocytosis** or **lung adenocarcinoma**.

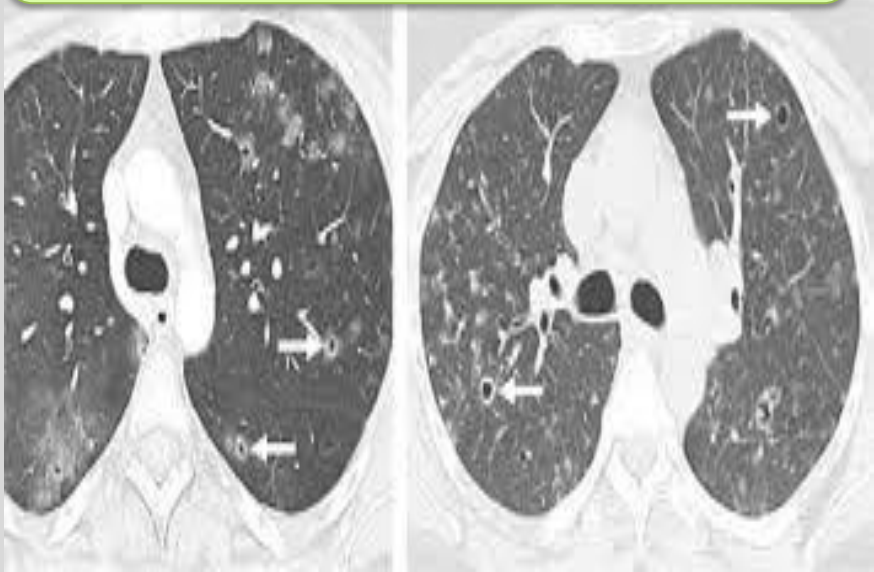
It is very similar to the appearance of the famous breakfast



The nodules that reproduce the cheerios appearance **should be distinguished** by **cavitated nodules**—in which the excavation area is due to the phenomena—and not to the proliferation of tissue around an airway.

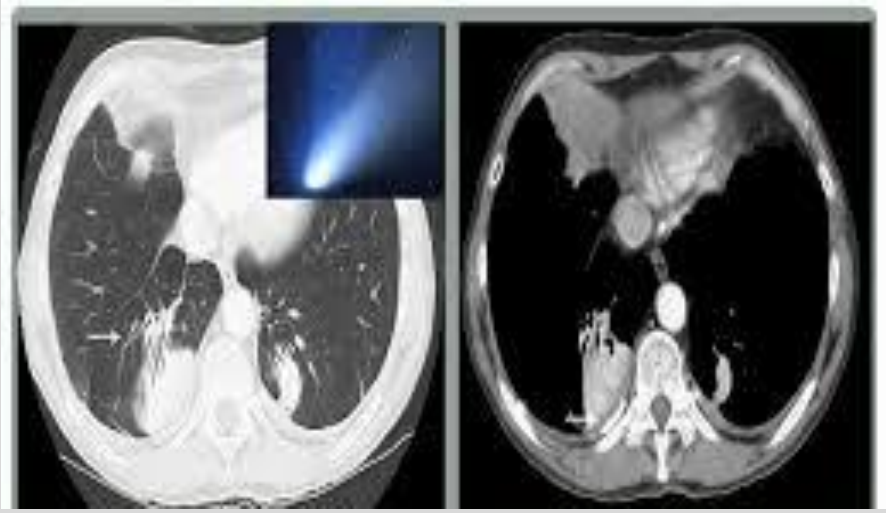
cavitated nodules

cheerios appearance



COMET TAIL SIGN

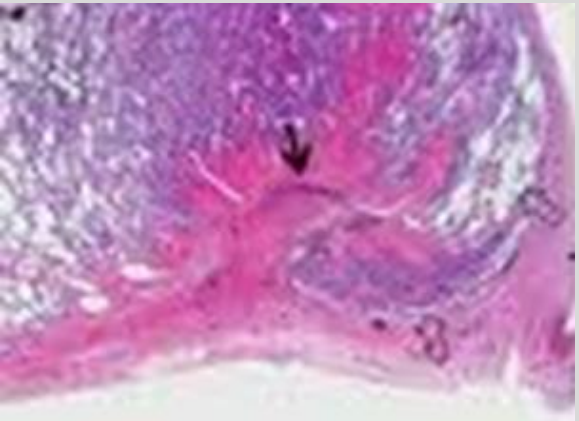
ذيل المذنب

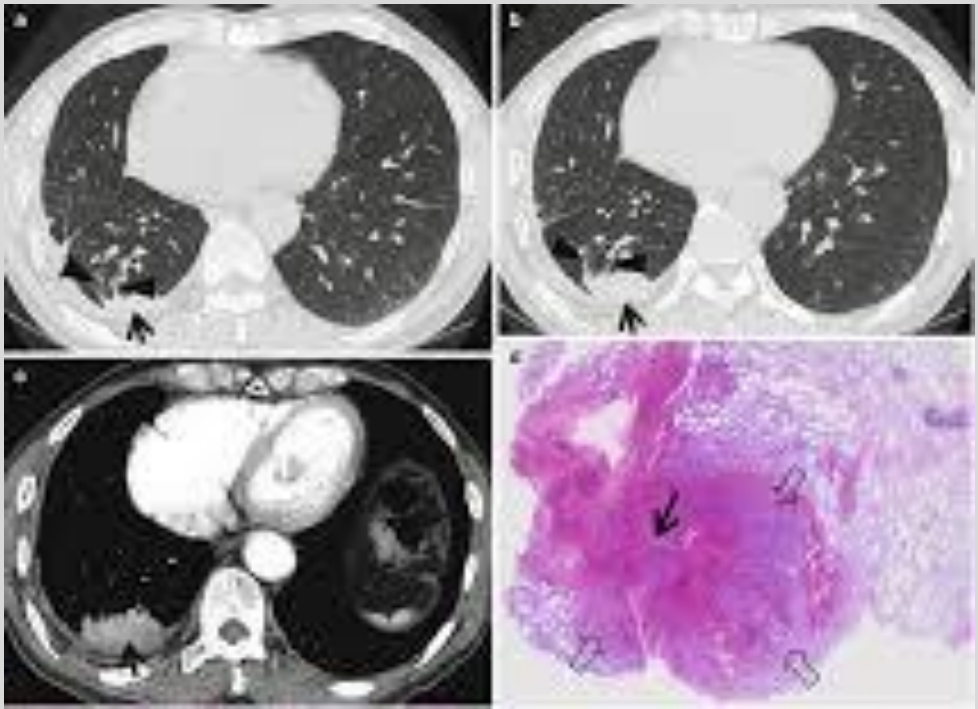


- classically described in **rounded atelectasis** of the lung.
- It consists of a curvilinear opacity that originates from a pleural-based opacity toward the ipsilateral hilum.
- The opacities resemble **a comet tail**

comprise **vessels and adjoining airways** that get pulled into **a mass-like opacity** as the lung collapses

Overlying **pleural thickening** is also invariably seen on the CT scan.

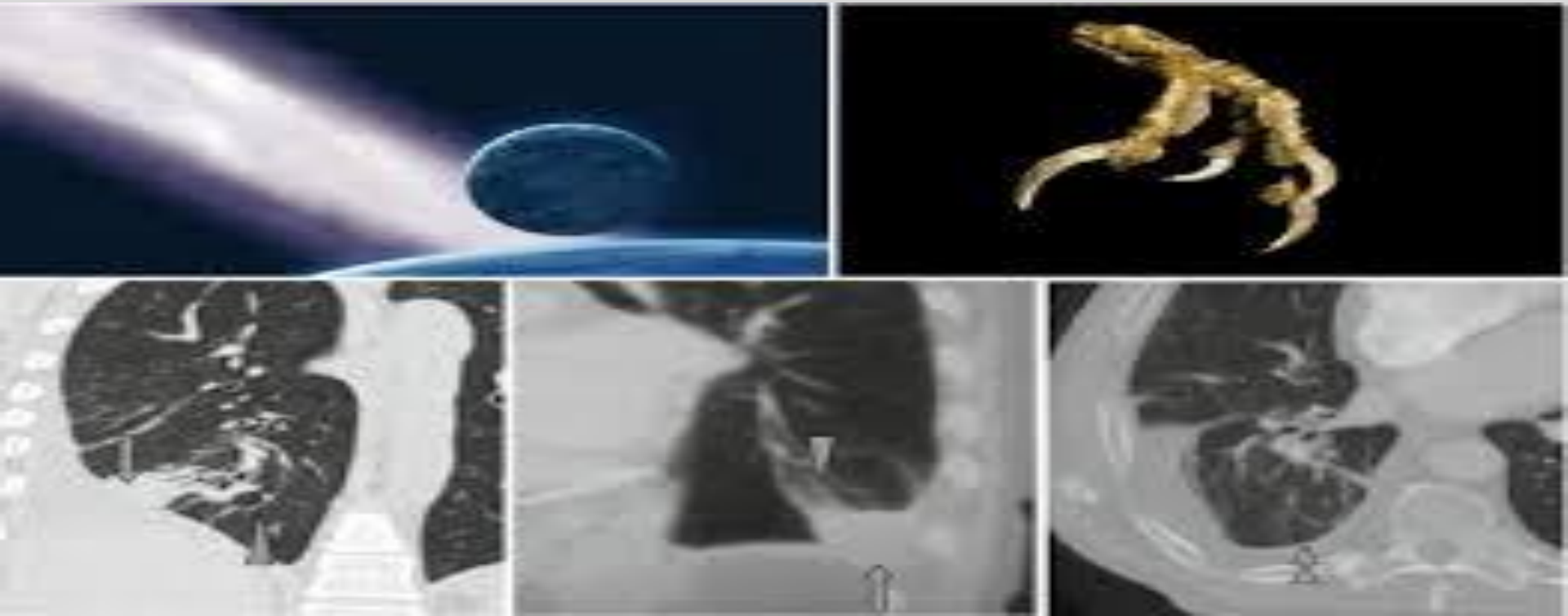




The **bronchovascular bundle** can at times be seen entering the mass from all sides and is referred to as the

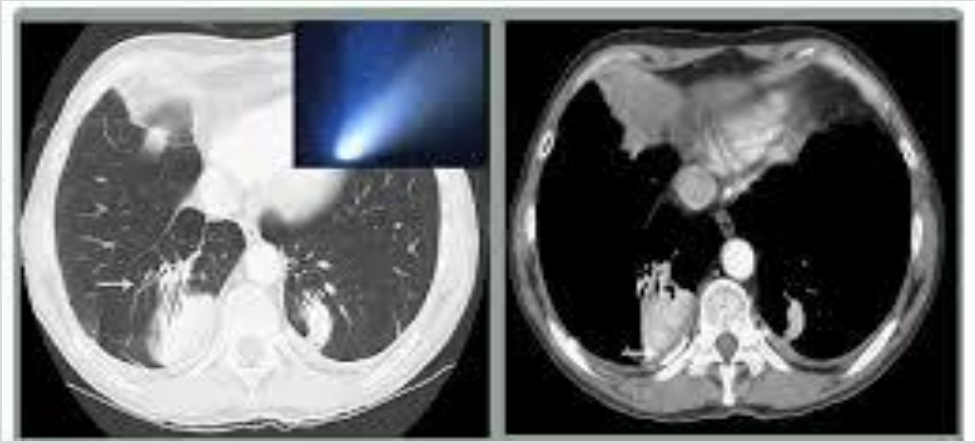
talon sign.

علامة المخلب



it has been given various names, such as

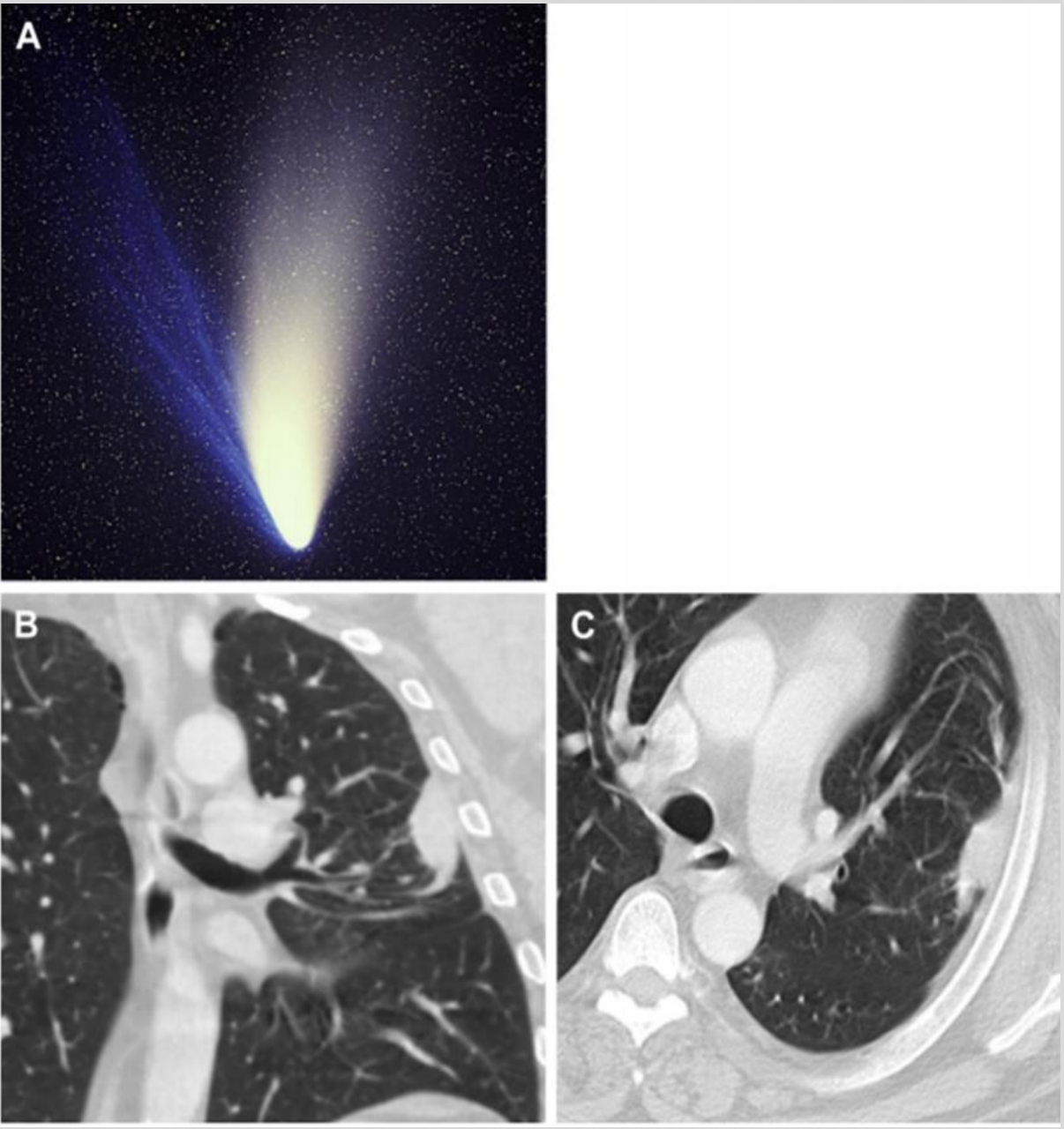
“**Blesovsky syndrome**” or “**atelectasic pseudotumor**



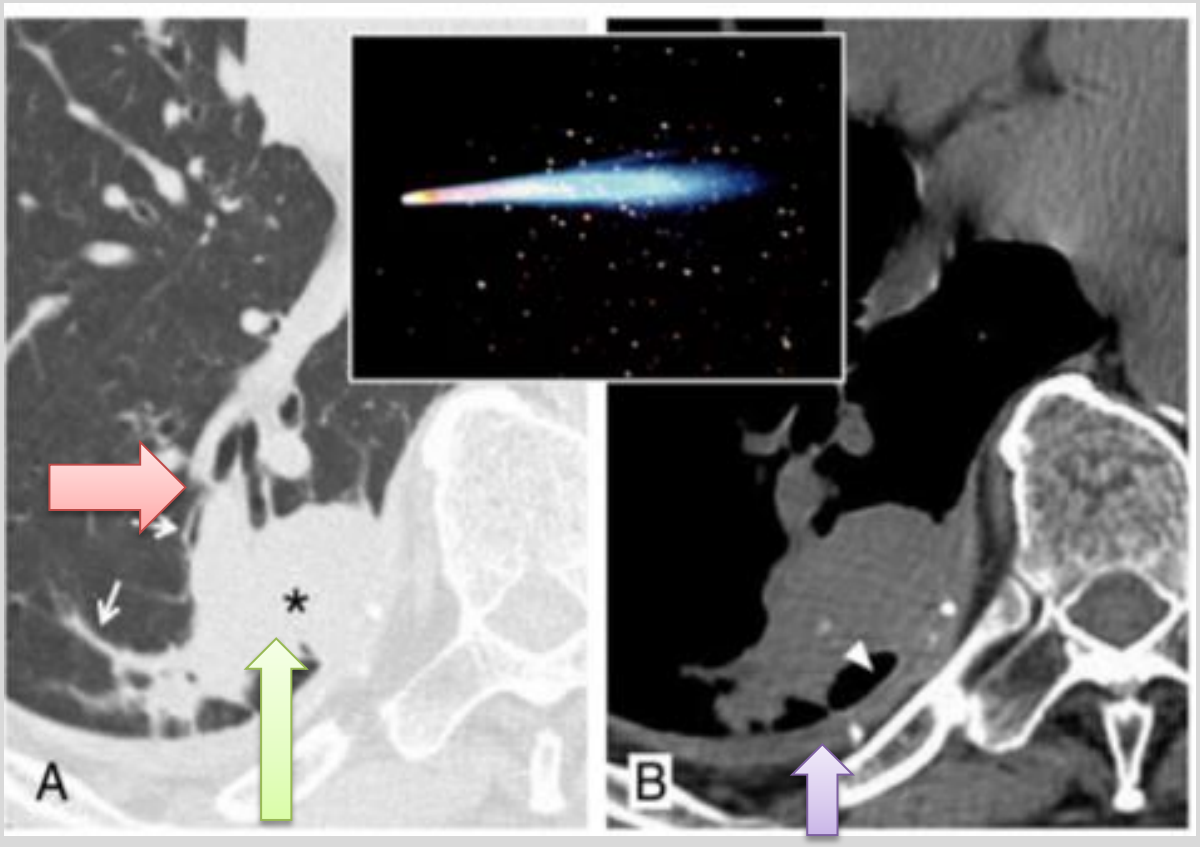
The atelectasis may be explained by the presence of irritant substances along the pleural surface,

such as **asbestos**

The main differential diagnosis includes **bronchogenic carcinoma**



Rounded atelectasis of the lung is benign, does **not require specific treatment**, often reduces in size, and occasionally **resolves spontaneously**



Comet tail sign

round consolidation

stretched vessel and bronchus

pleural plaque with calcification

Doughnut sign

الدونات

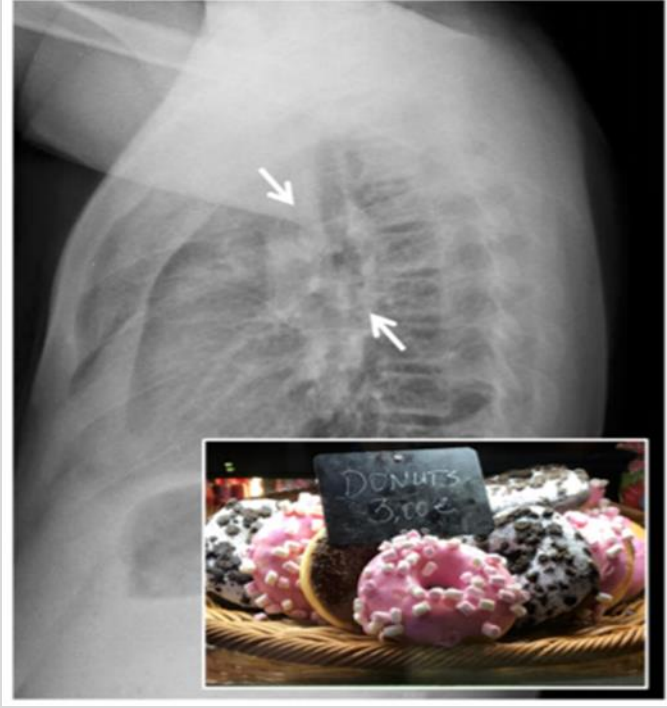
The “doughnut sign” is recognizable in the

latero-lateral projection of a chest radiograph or in the lateral projection of the **CT** scout:

it consists of **a complete radiopaque ring**,

which resembles a doughnut .

Doughnut sign



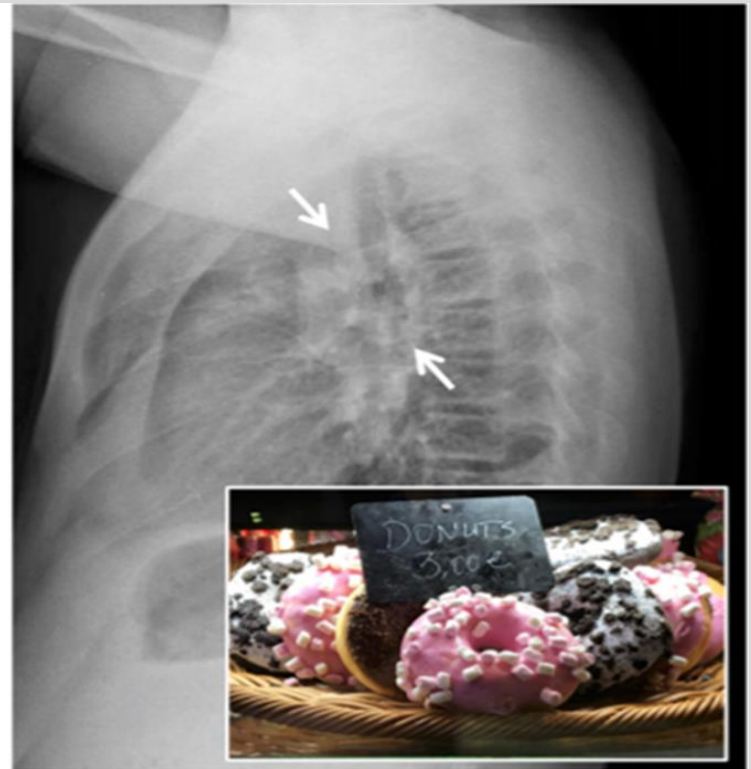
It is reproduced by normal profiles of right and left pulmonary arteries and aortic arch anteriorly and superiorly and by lymphadenomegaly inferiorly.

The lymph nodes that complete the radiopaque ring are those of the **subcarinal, hilar, and retrocarinal mediastinal** sites.

The **radiolucent center** of the “doughnut” consists of the **trachea and the bronchi for the upper lobes**.

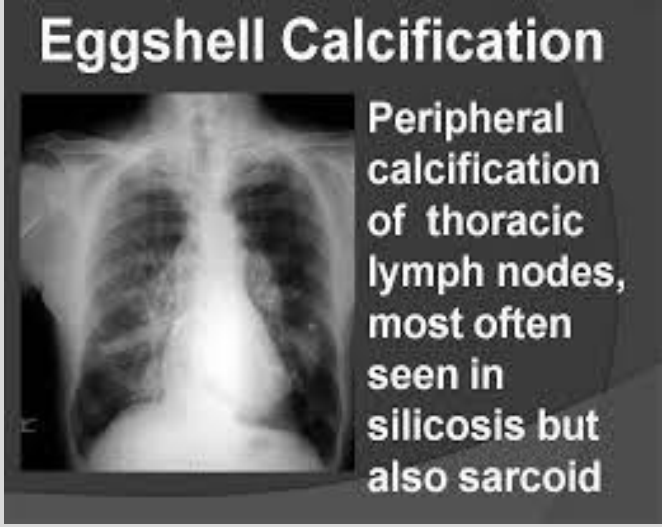
This sign could be suggestive of **lymphadenopathy**

This sign is frequently found in cases of **tuberculosis and lymphoma**



Eggshell calcifications

تكلس قشر البيض



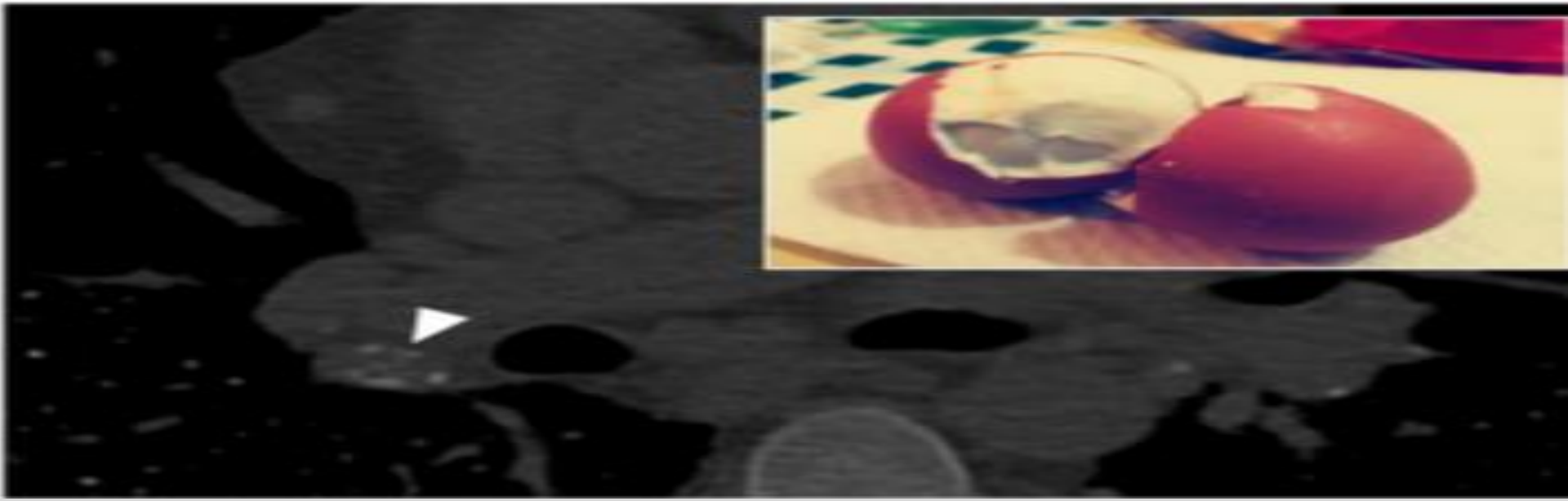
The “eggshell” calcifications can be observed on **chest** radiographs and **CT** images

they represent **lymph nodes** with **lamellar calcifications**.

Eggshell calcifications are a non-specific sign

which may be found in various diseases such as

advanced sarcoidosis,
silicosis,
pneumoconiosis,
scleroderma,
amyloidosis,
lymphoma after radiotherapy,
blastomycosis,
histoplasmosis



Eggshell calcifications.

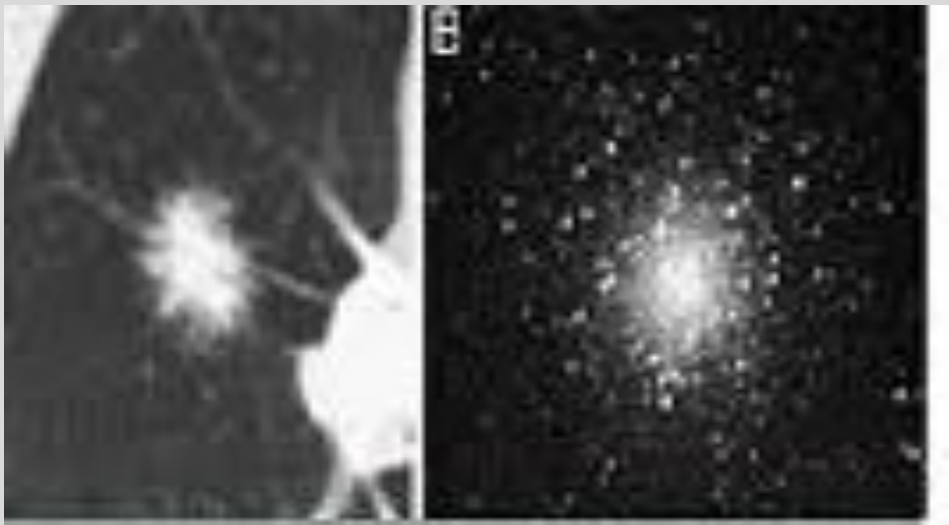
A small peripheral lamellar calcification (white arrowhead) of an **enlarged lymphatic node**, in a patient with **silicosis**

Galaxy Sign

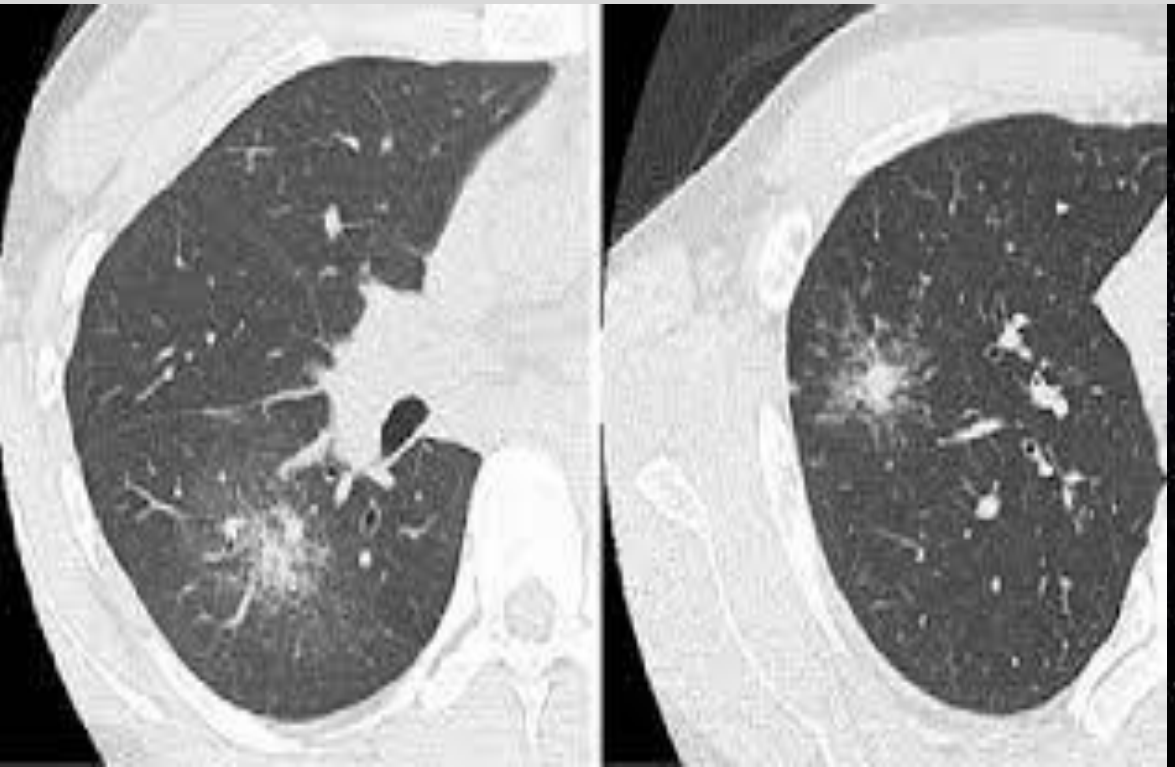
المجرة

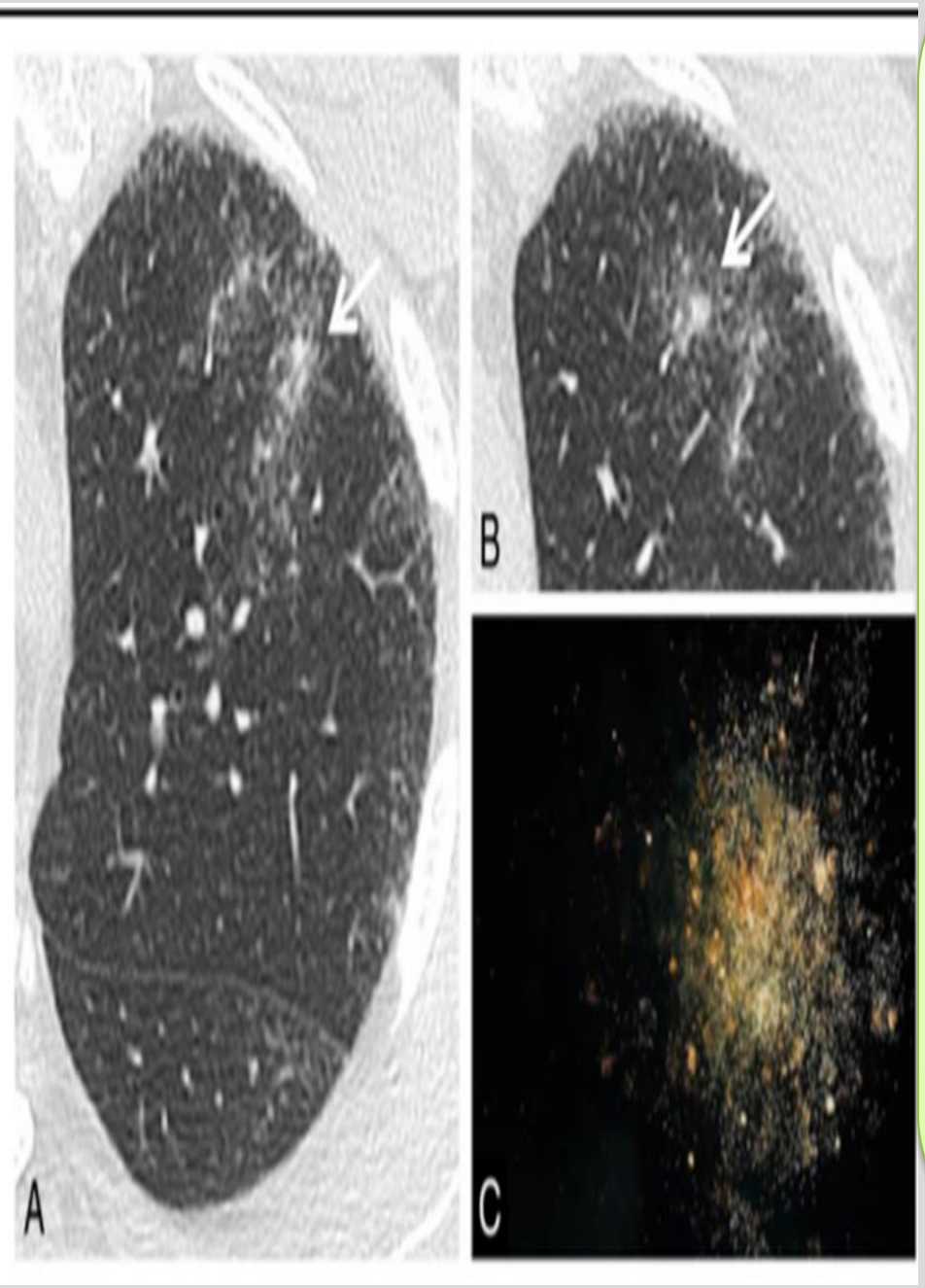
also called the **sarcoid galaxy**

is used to describe **pulmonary parenchymal nodules** seen in **sarcoidosis** that is composed of several smaller interstitial nodules



The appearance of a **central dense mass** with **tiny peripheral satellite nodules** is **akin to a galaxy cluster**.





Galaxy sign.

The figure shows two ill-defined nodular consolidations in the left upper lobe, surrounded by satellite small nodules (white arrows in a and b). The presence of small nodules—close to the central nodular areas—resemble the appearance of a “galaxy” (evocated in the embedded figure c**).**

This galaxy appearance is a typical finding of sarcoidosis

This sign can also be seen in

progressive massive fibrosis and

in **active pulmonary TB**.

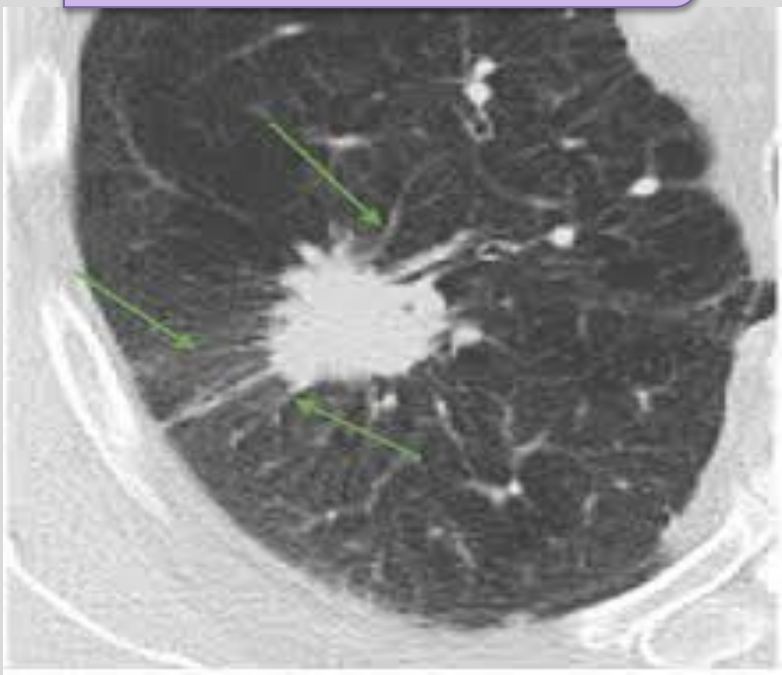
Clinically, the identification of a galaxy sign favors **a benign diagnosis**.

The satellite nodules must be distinguished from spiculated lung nodules typical of malignancy.

benign

Galaxy Sign

malignancy



spiculated lung nodules

Feeding vessel sign

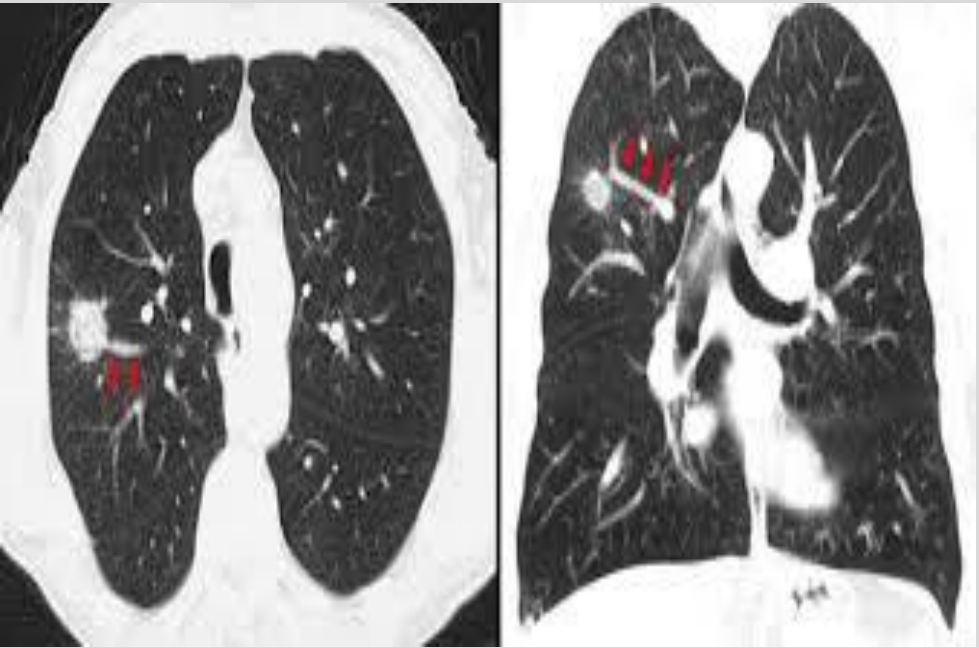
الوعاء المغذي

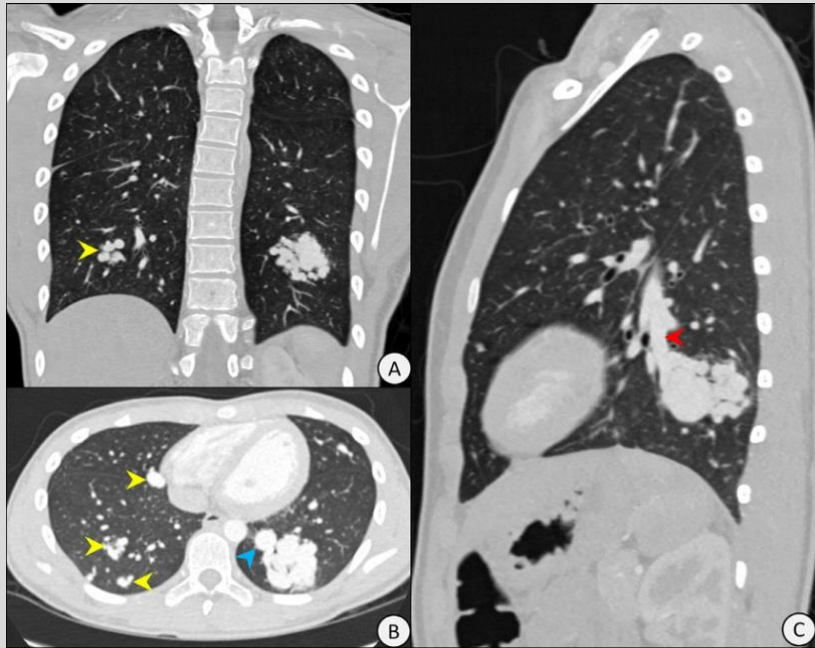
is produced by the presence of a **pulmonary vascular branch** that runs towards a focal lesion

This radiological sign has two main meanings:

(1) **vascular origin** of the lesion (for example, in cases of arteriovenous malformations or embolism) and

(2) **neoplastic nature** of the lesion, with high neoangiogenetic activity.



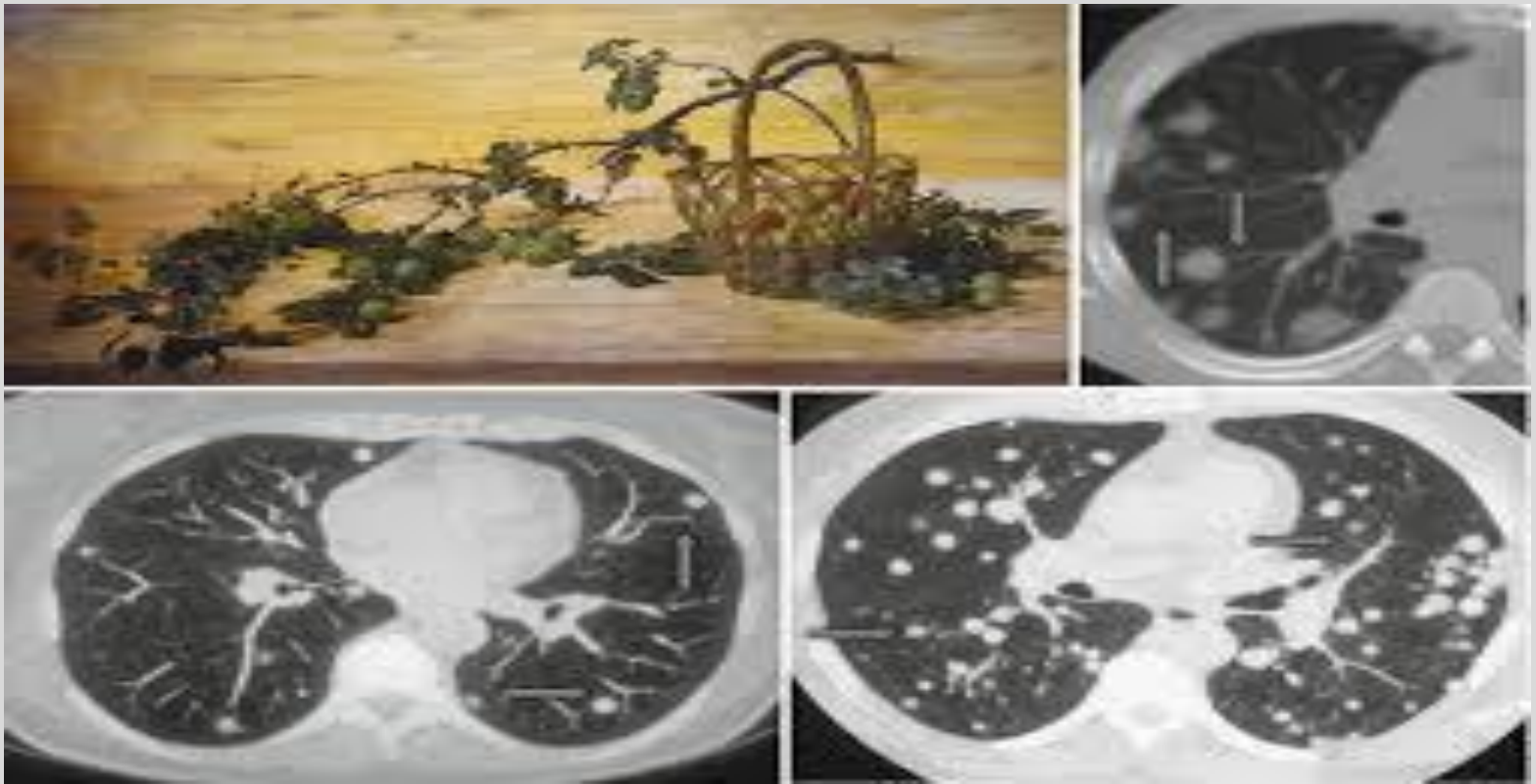


The sign, also known as

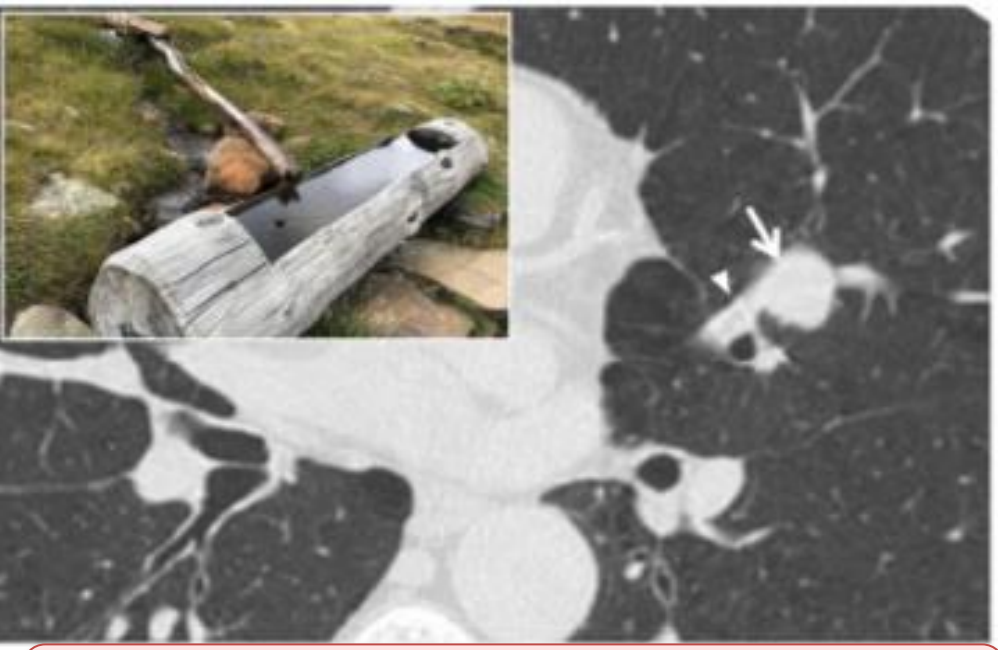
“fruits on the branch sign”

الفاكهة في الغصن

has been associated with the presence of **metastases or septic emboli**



Feeding vessel sign

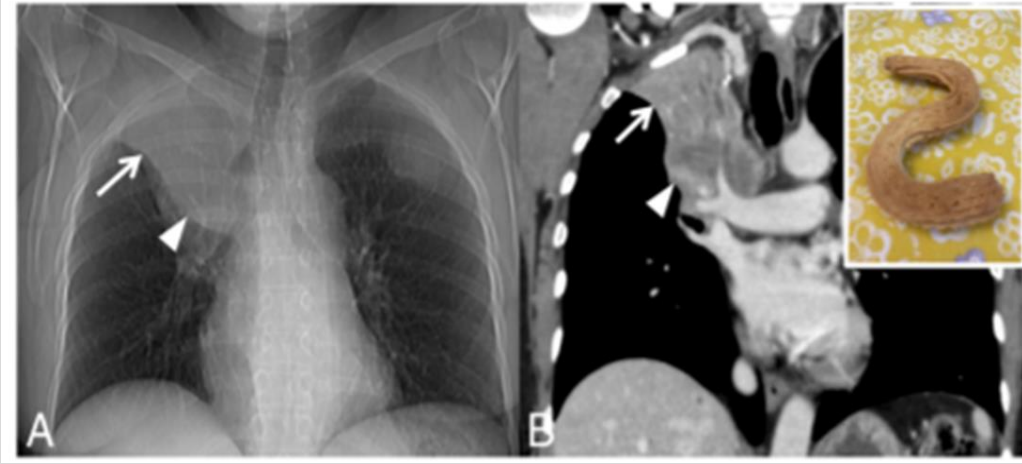


a pulmonary arterialvenous malformation

it resembles the channel of water which provides adequate filling

metastatic disease of the lung.

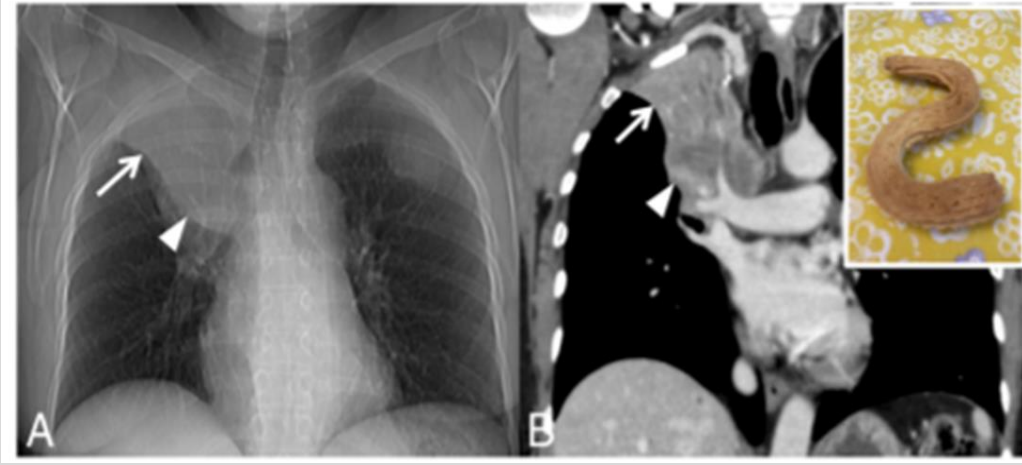
Golden S-sign
s الذهبية



The golden S-sign consists of an “S” profile reproduced on **posterior-anterior chest radiograph**

by the presence of **right upper lobe atelectasis** with **mass at right hilum**.

Golden S-sign



It has been also called

"reverse S sign of Golden" المقلوبة

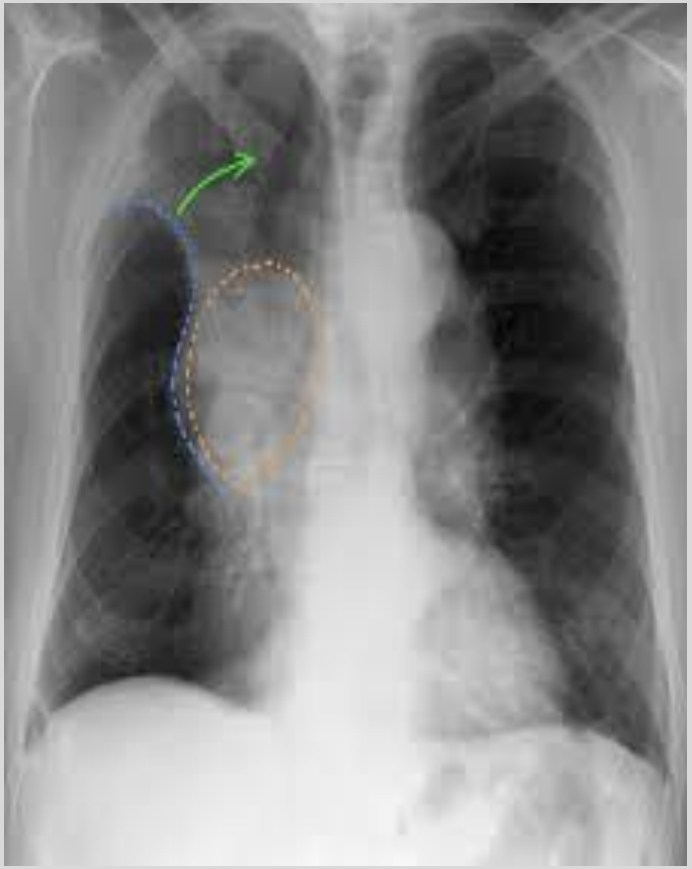
and has been first described by Ross and **Golden** in 1925,

who highlighted a **right upper lobe collapse** due to the presence of **bronchogenic carcinoma** of the right hilum

On chest radiographs

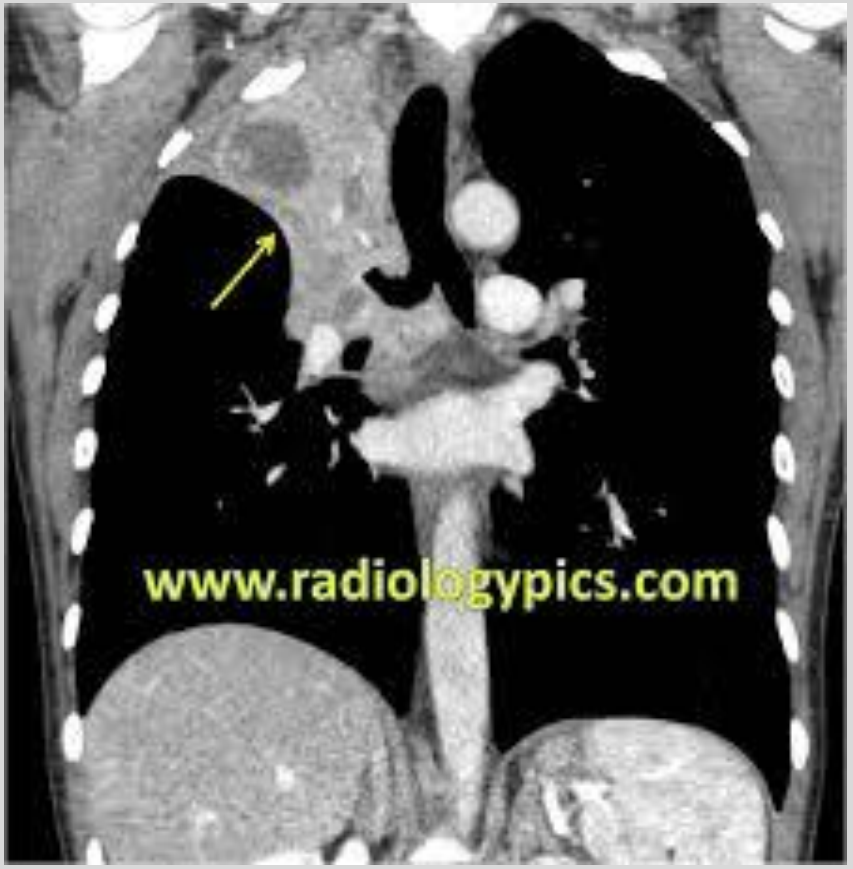
the superior and lateral part (concave inferiorly) of the “S” profile is represented by the **upper lobe collapse**,

whereas the inferior and medial part (**convex inferiorly**) may be explained by the associated **pulmonary mass** .



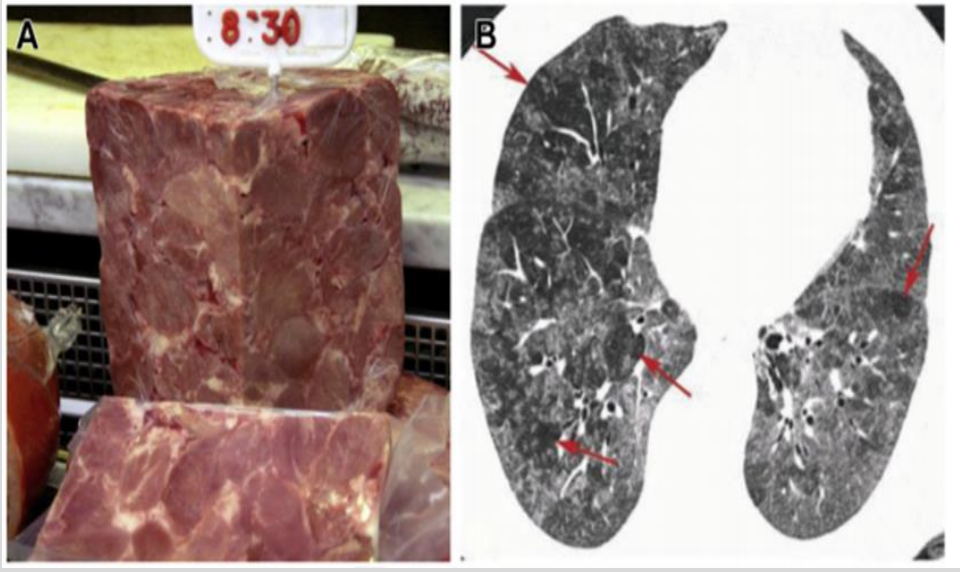
This sign may be more easily appreciated on **MDCT**

it can be also recognizable not only in cases of **pulmonary bronchogenic carcinoma**, but also in cases of **lymphadenopathy or mediastinal tumors**.



Headcheese sign

لحم الرأس

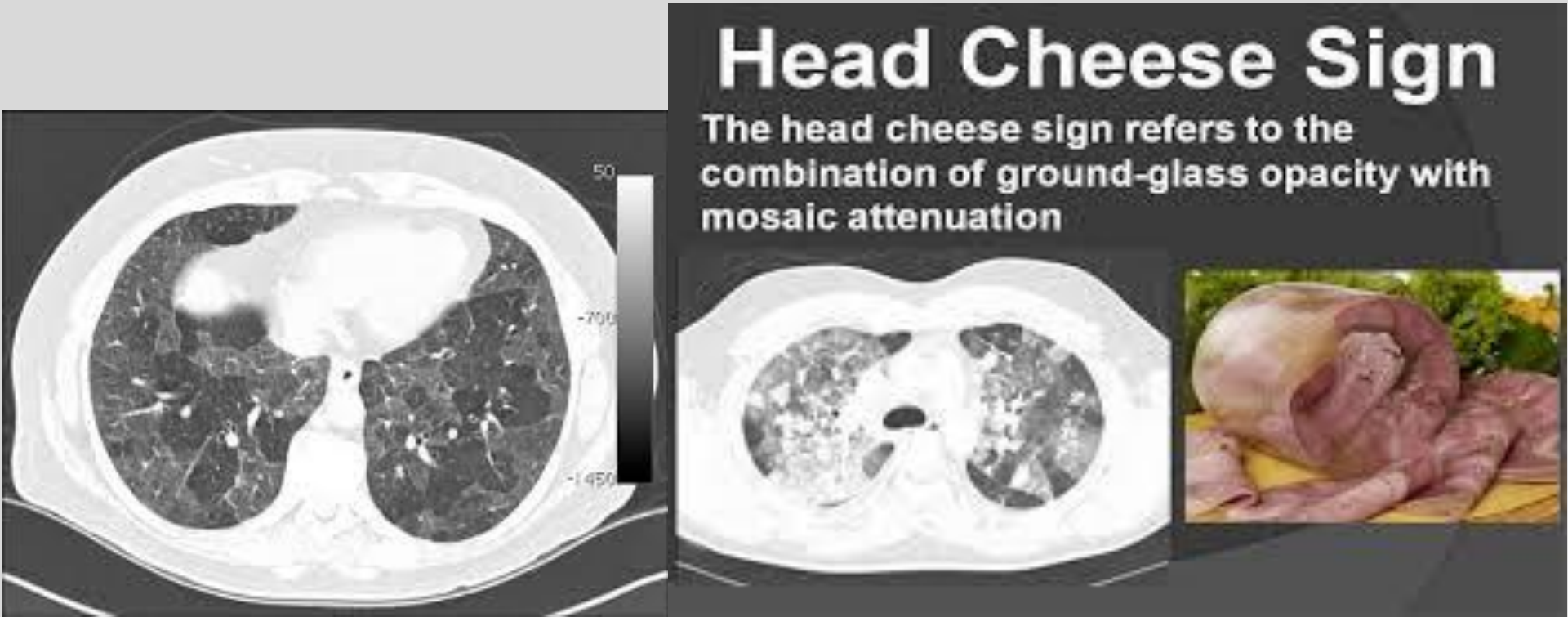


Head cheese is a type of **terrine** made from pieces of meat obtained from various parts of different animals, such as a calf or pig .

The head cheese sign is characterized by the juxtaposition of distinct radiographic areas of

low, normal, and high attenuation

The **CT** scan image bears close resemblance to the cut surface of a head cheese and hence the name.



It was considered pathognomonic for **subacute hypersensitivity pneumonitis**

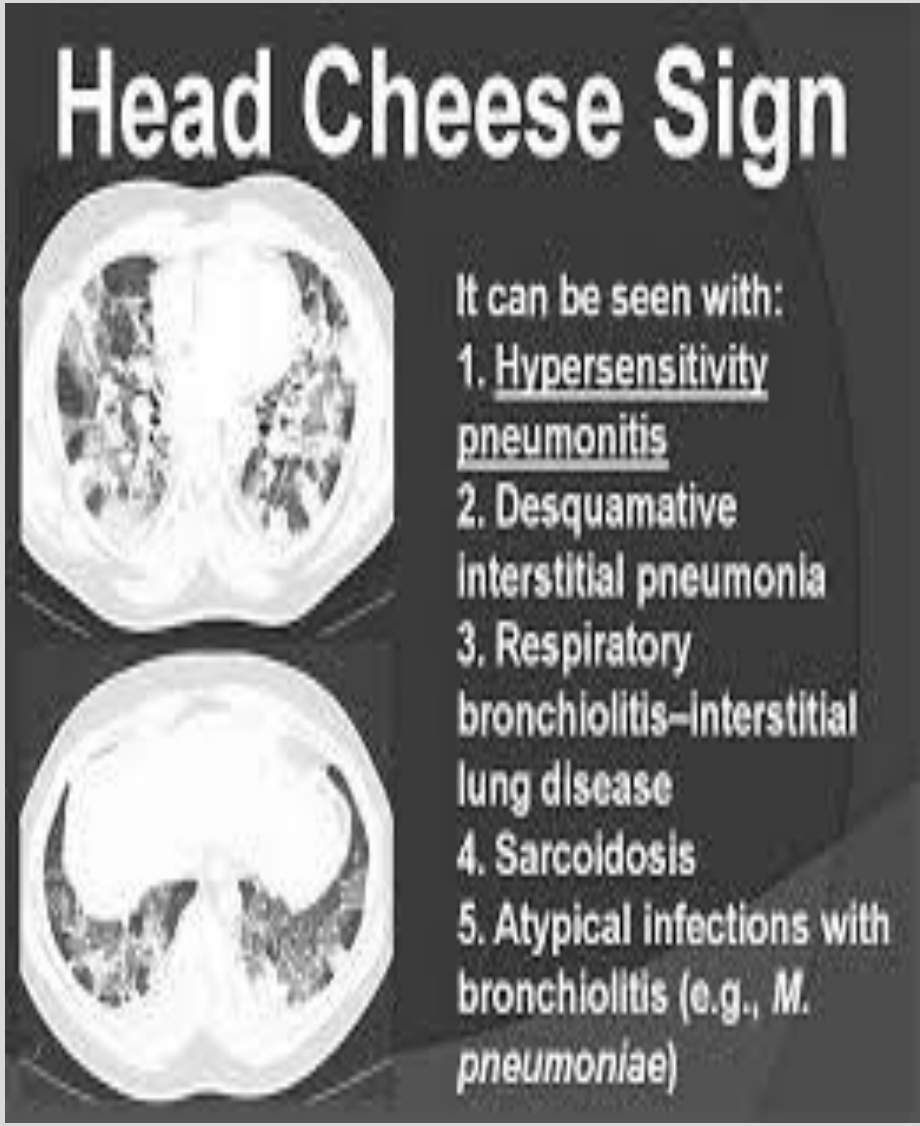
but, more recently, it has been described with other conditions such as

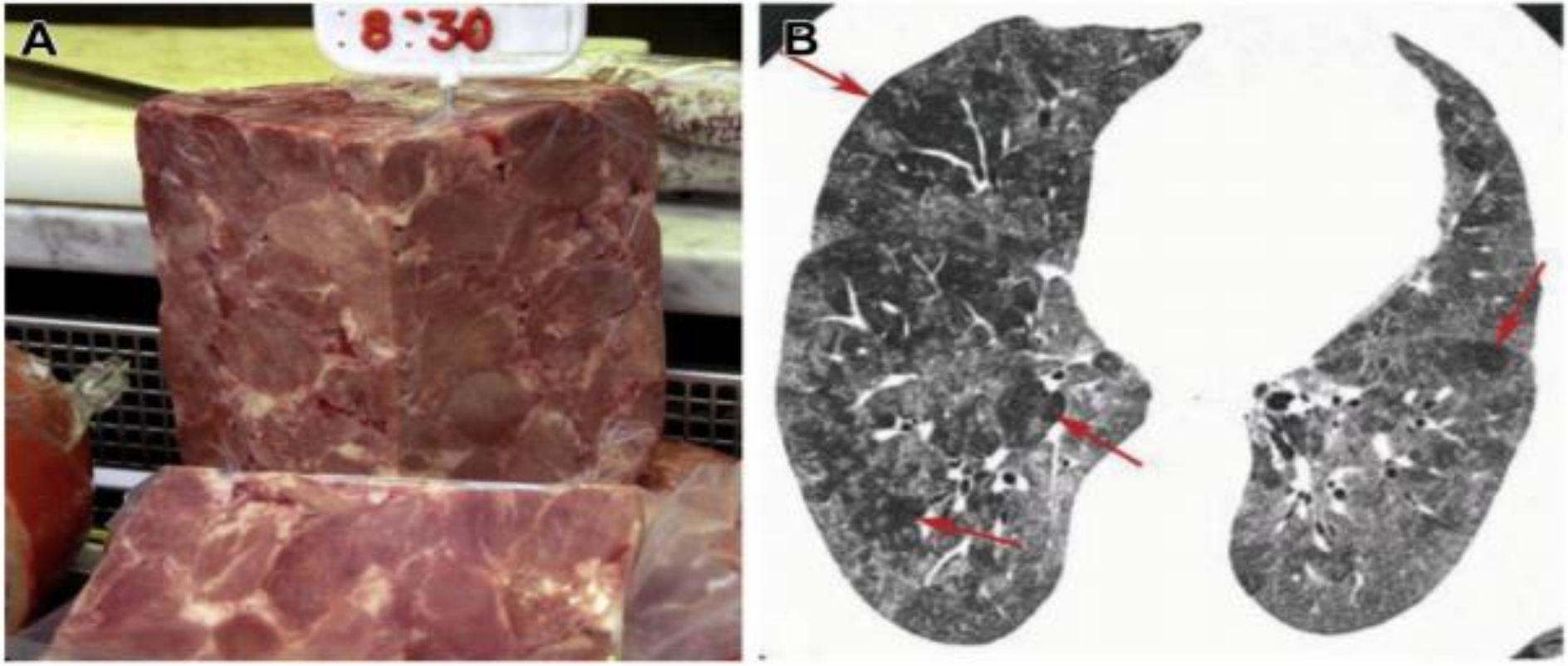
Sarcoidosis

Respiratory bronchiolitis,

Atypical infections

(eg, Mycoplasma pneumoniae).

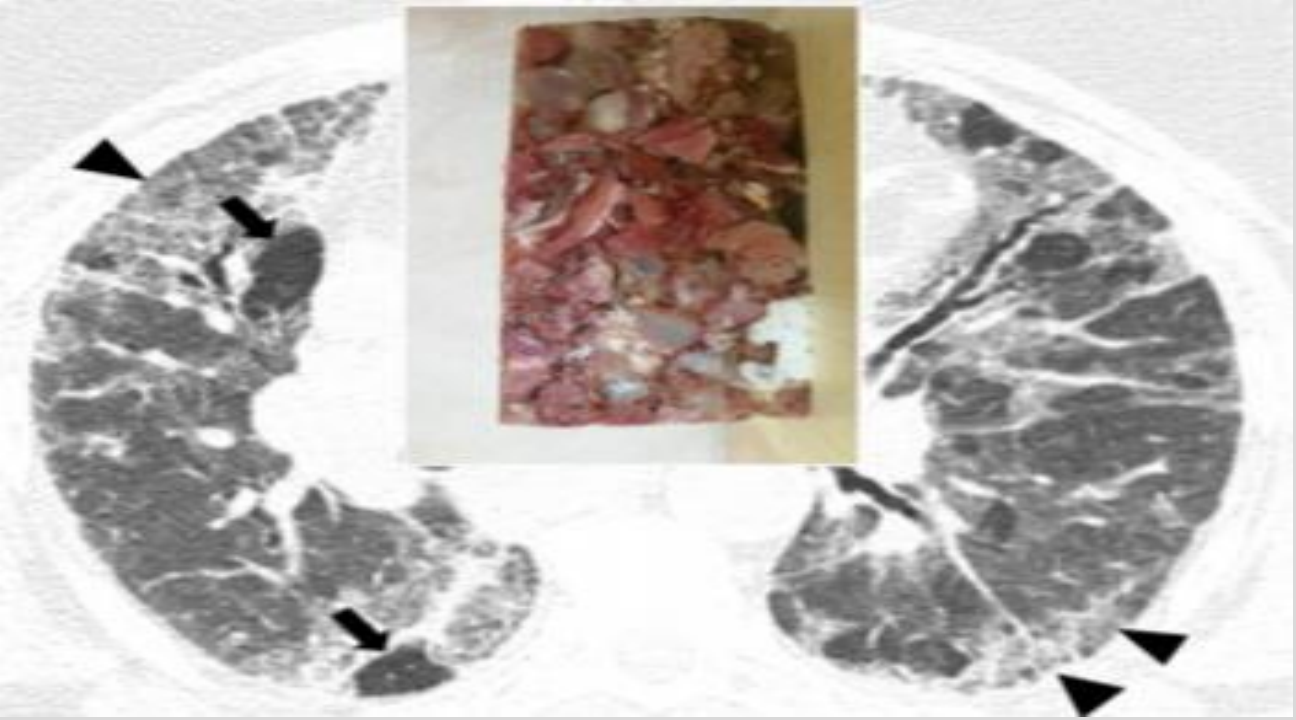




Graphic showing a cut piece of a head cheese.

The head cheese sign seen in a patient with **hypersensitivity pneumonitis**.

Note the areas of **ground glass** opacities interspersed between normal and hypo-attenuated lung fields



Headcheese sign.

This sign consists in **a mixed** pulmonary pattern with areas of various attenuation. It is characterized by the contemporary presence of areas of

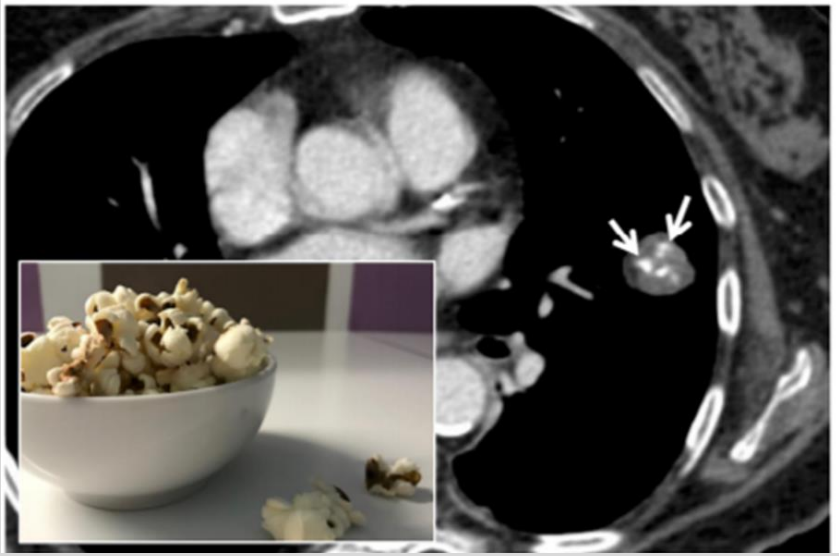
ground glass attenuation (black peripheral arrowheads, due to infiltrative diseases),

air-trapping (black arrows),

and **healthy lung zones**.

Popcorn calcification

تكلسات البوشار



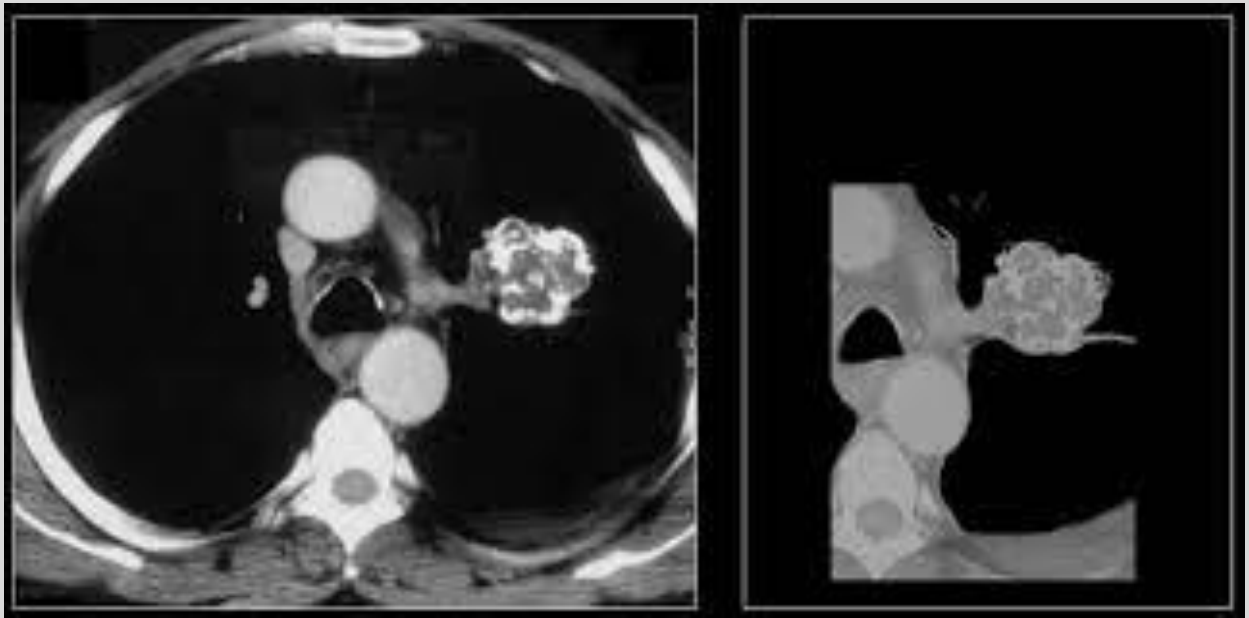
This sign refers to the presence of **amorphous calcifications**, often **ring-shaped**, which remind us of the appearance of a piece of popcorn

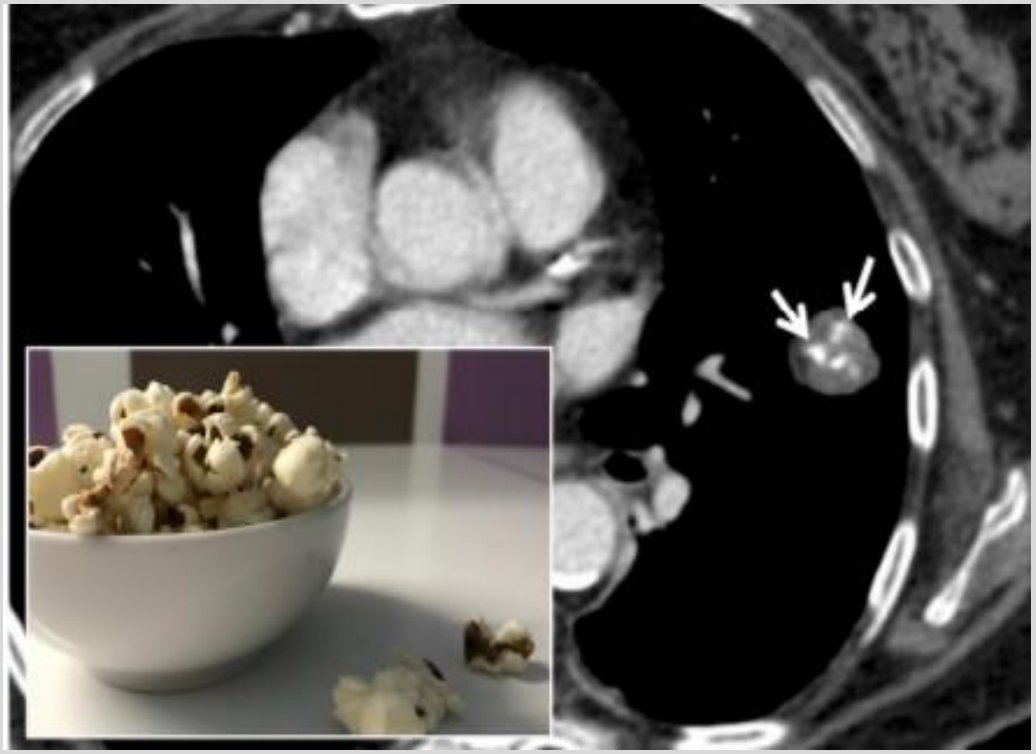
detected on **chest** radiographs

but better on pulmonary **CT** scan

popcorn calcifications within a well-defined nodule suggest a diagnosis of **benignity**, namely **hamartoma.**

popcorn calcifications would be present only in **10%** of pulmonary hamartomas





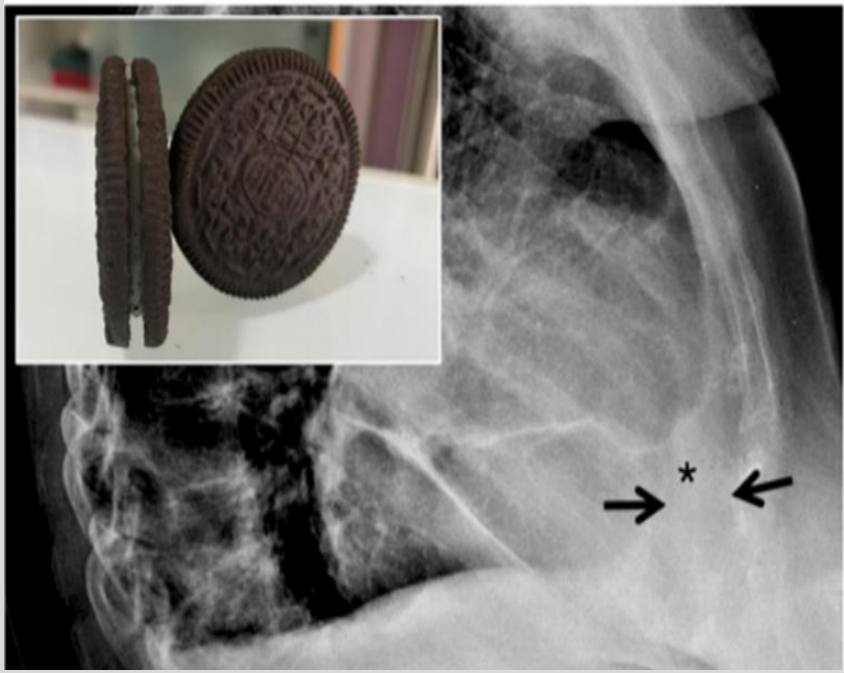
Popcorn calcification.

pulmonary hamartoma.

The figure shows the presence of a pulmonary hamartoma, which is characterized by the presence of fat and amorphous calcification (white arrow), which remind us of the appearance of a piece of popcorn

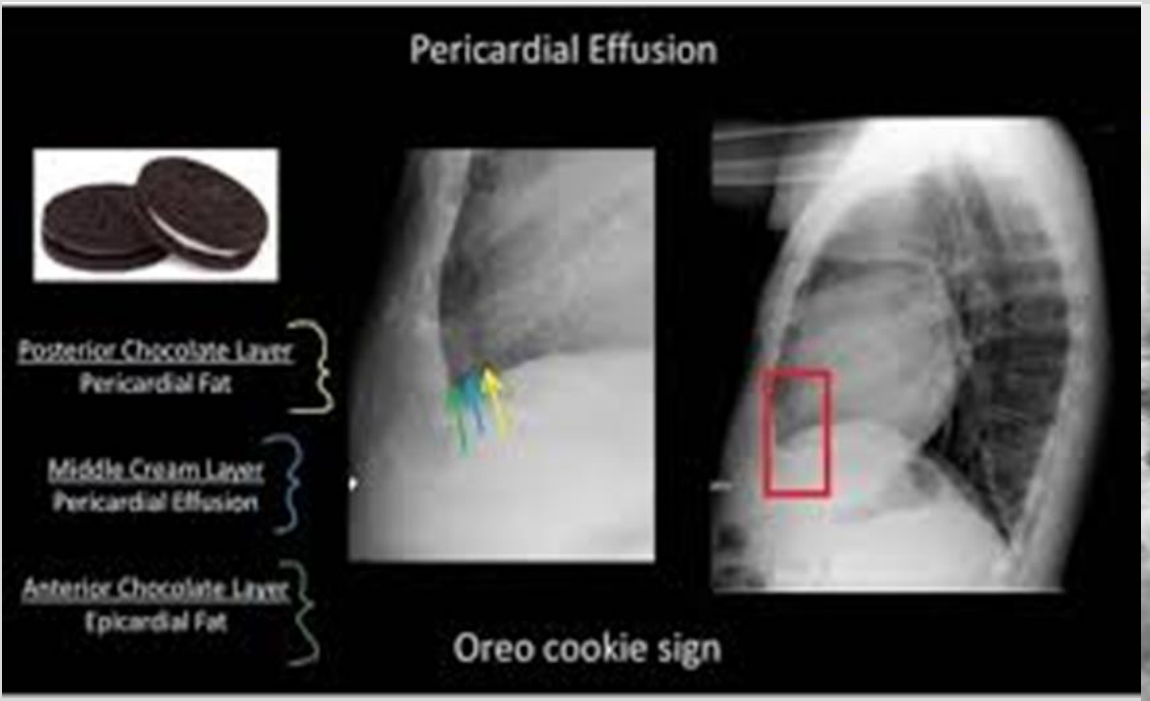
Oreo cookie sign

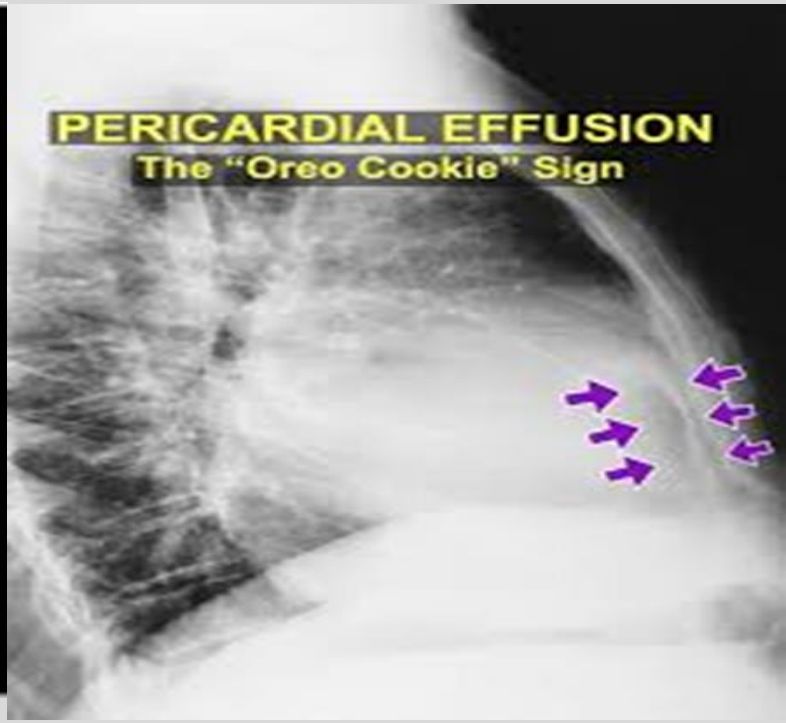
بسكويت الاوريو



refers to the aspect of the **pericardial effusion** which may be seen on the

lateral *chest radiograph* .





Typically, the pericardial effusion causes an **increased radiopacity of the pericardium**,

which appears to be anteriorly and posteriorly delimited by **two radiolucent lines**.

These lines correspond respectively to the pericardial fat and the epicardial fat

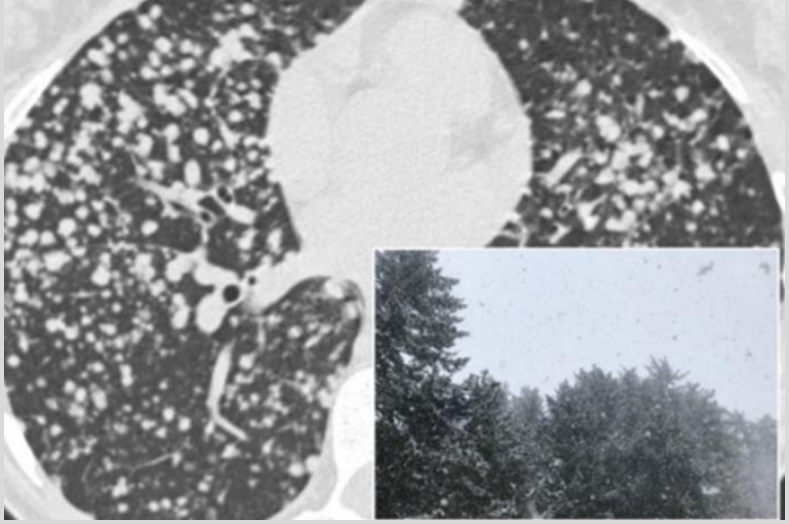
black asteris : caused by pericardial effusion

black arrows:caused by pericardial and epicardial fat.

Oreo cookie sign.

Snowstorm sign

العاصفة الثلجية



due to **miliary** diffusion of **innumerable micronodules**

(1–2 mm) in all the pulmonary parenchyma

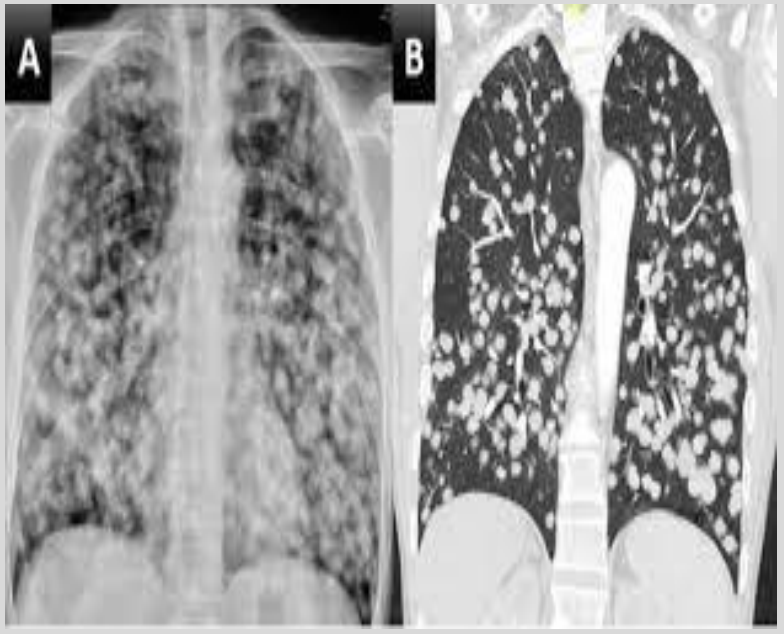
لا تعد ولاتحصى

This radiological feature may be appreciated on chest radiograph and CT

this radiological appearance for small and innumerable metastatic nodules related to **vascular tumors**

(thyroid gland carcinoma **papillary** , renal cell carcinoma)

whereas they recommend the term **cannonball metastases** for lesions showing big size and accurately outlined, due to **gastrointestinal tumors**



differential diagnosis include

Miliary tuberculosis

Fungal infections (histoplasmosis, coccidioidomycosis),

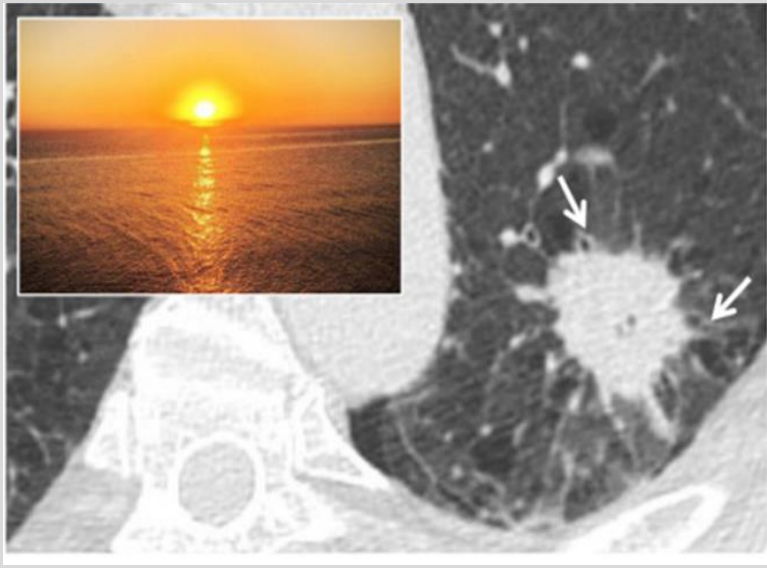
Sarcoidosis

Chickenpox infection calcifications.

Sunburst sign

OR

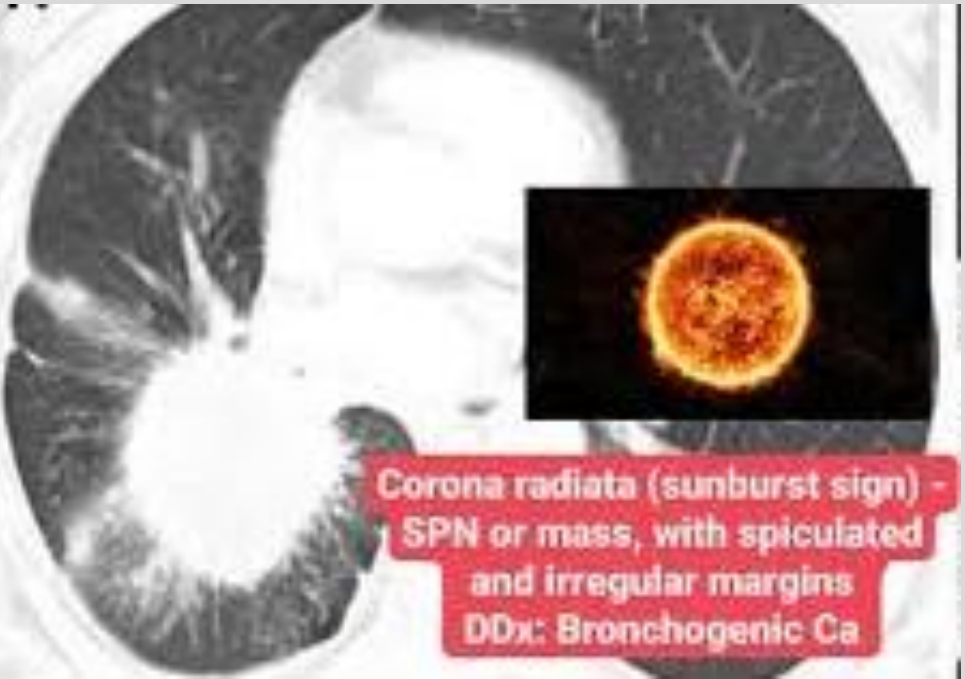
Corona Radiata Sign



شروق الشمس- اشعاعات الكورونا

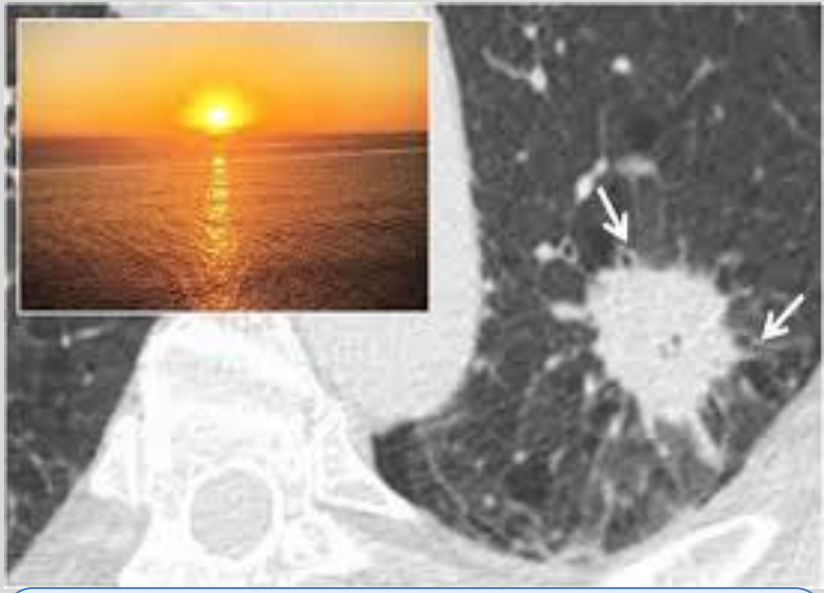
The “sunburst sign” is represented by a pulmonary **nodule or a parenchymal mass** with irregular and spiculated margins, such as **sunrays**

The rays or the spiculated margins are constituted by the **distorted blood vessels** and/or by **thickened septa** that surround the pulmonary nodule

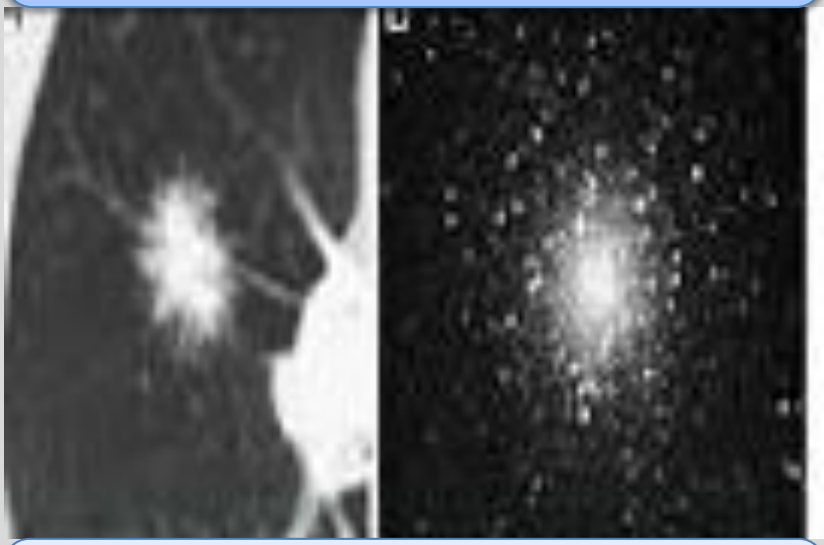


In the differential diagnosis,

it is very important to include the **galaxy sign**, which refers to benign micronodules around a nodule of sarcoidosis.



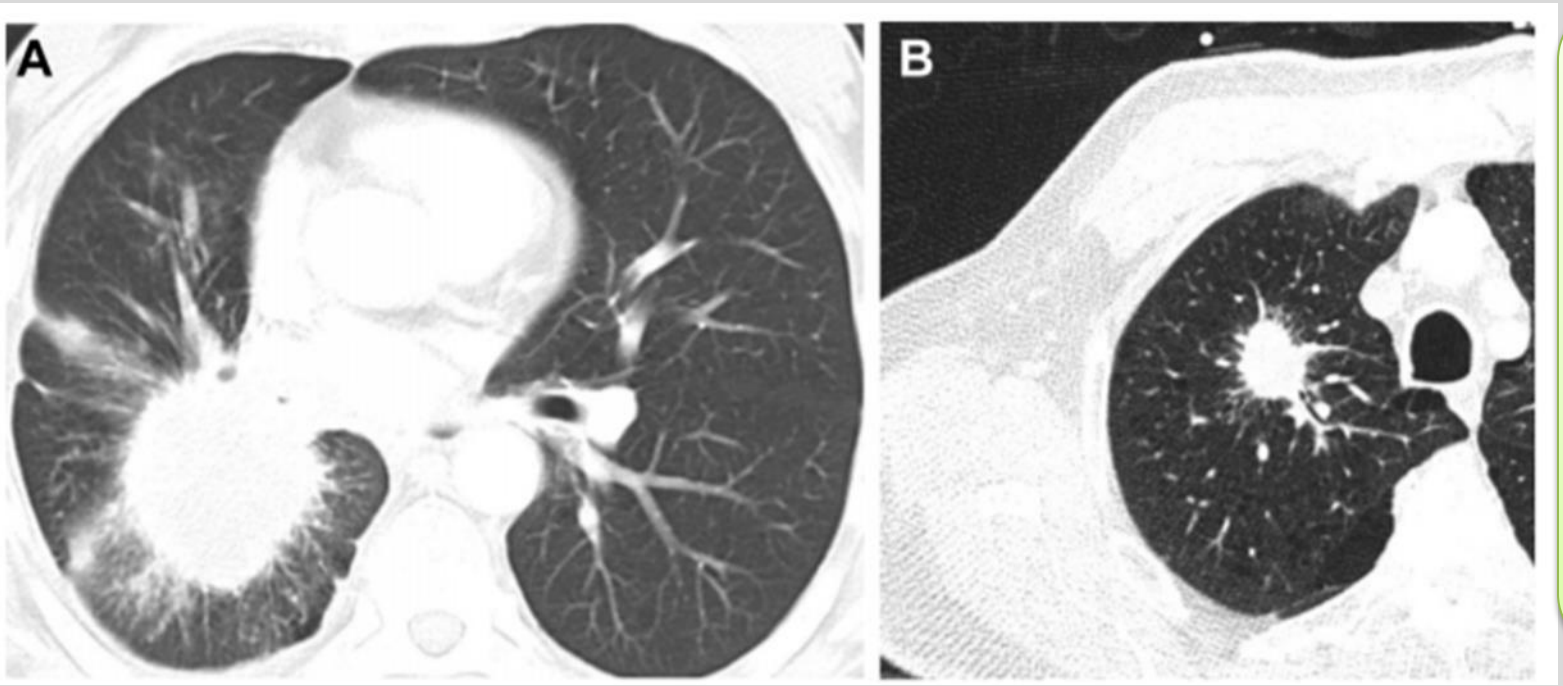
sunburst sign



galaxy sign

The sunburst sign is very suggestive of a **malignant** lesion, in particular for pulmonary **adenocarcinoma**

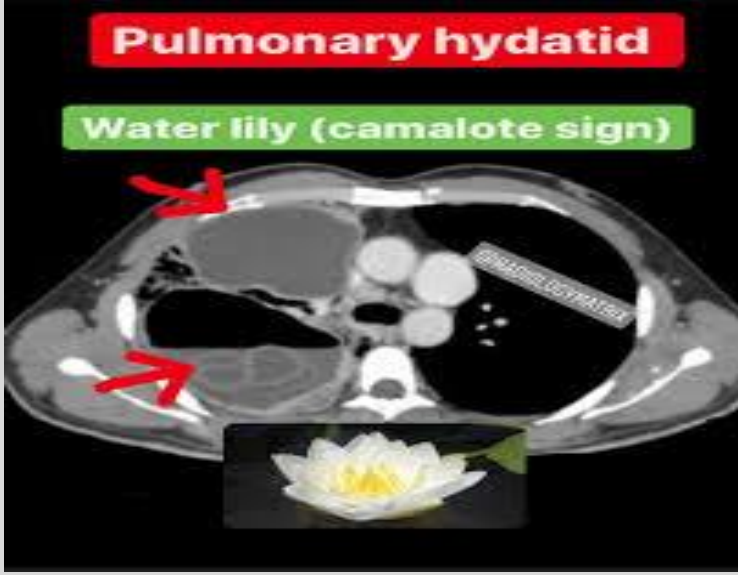
the presence of speculated margins is considered a **risk factor for malignant neoplasia**



non-small cell lung cancer

WATER LILY SIGN

زنبق الماء

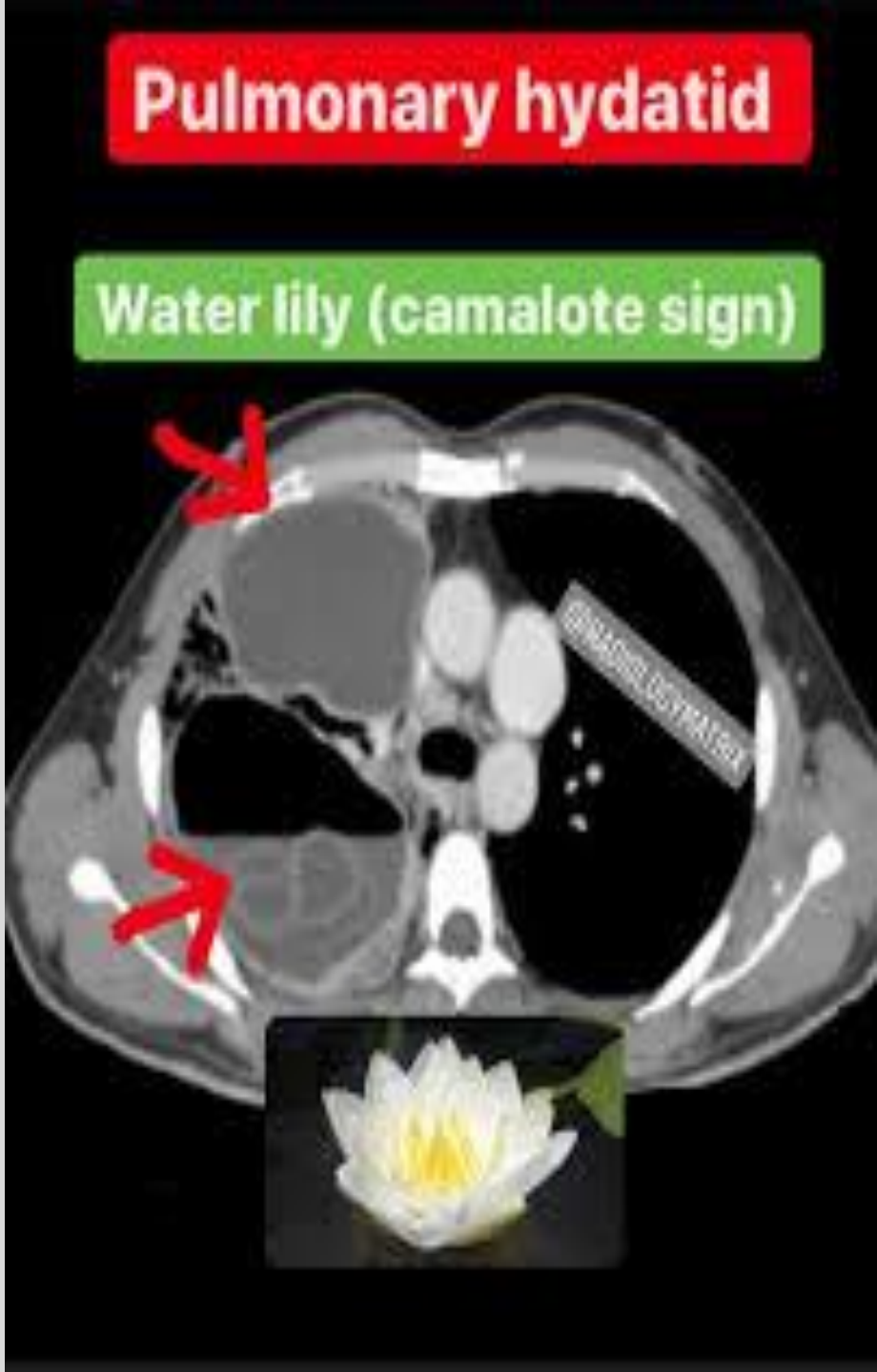


The water lily sign is also known as the **camalote sign**.

It can be seen on both chest **radiographs** and chest CT scans.

Although **rarely** seen, it is pathognomonic for cystic echinococcosis, caused by the hydatid tapeworm, **Echinococcus granulosus**.

It comprises a hydatid cyst in the lung with **a free-floating endocyst**, which collapses and floats in the cystic fluid, similar to a water lily



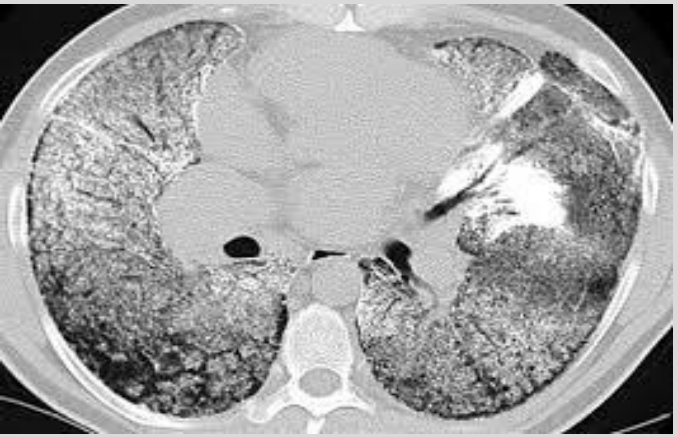
Sand Storm Sign

العاصفة الرملية

seen in both chest **radiographs** and **CT** scans

has been used to describe diffusely dense **micronodular calcifications**

seen in pulmonary **alveolar microlithiasis**



Pulmonary alveolar microlithiasis is a rare disease of both sporadic and familial occurrence,

characterized by **diffuse deposition of calcium phosphate microliths**,

measuring up to 3 mm (called calcipherites) in the alveolar spaces and along a peribronchial distribution.

The pleural margin appears as a black lucent line between the ribs and the surrounding calcified parenchyma

Sand storm sign
black pleural line sign

This margin has been described as the

black pleural sign

Associated HRCT findings include GGOs, **interlobular septal calcifications**,

"sand storm" appearance, and **crazy paving pattern**

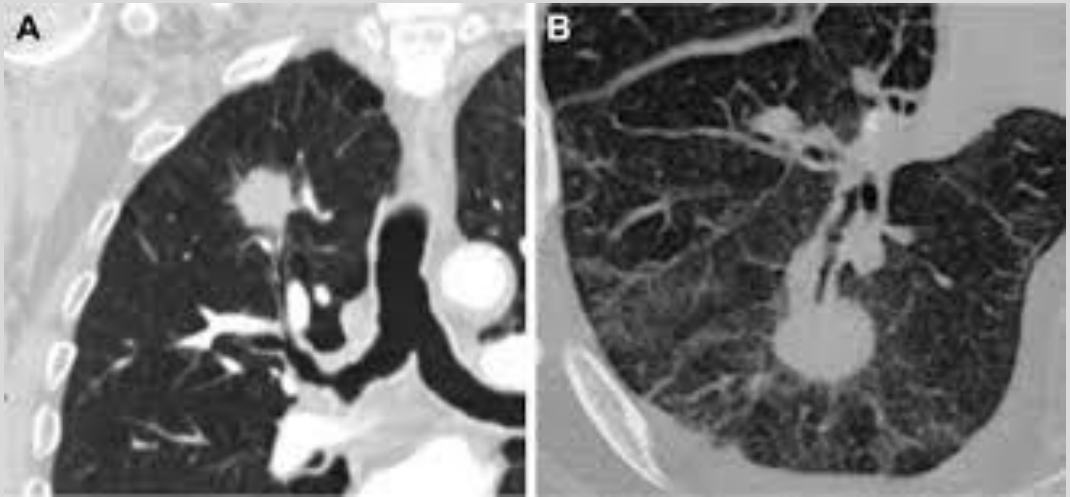
Positive bronchus sign

القصبة الايجابية

On chest **CT** images

consists of an **air-filled bronchus**

seen as a **tubular** hypo-attenuation area **oriented** towards a **peripheral nodular formation**

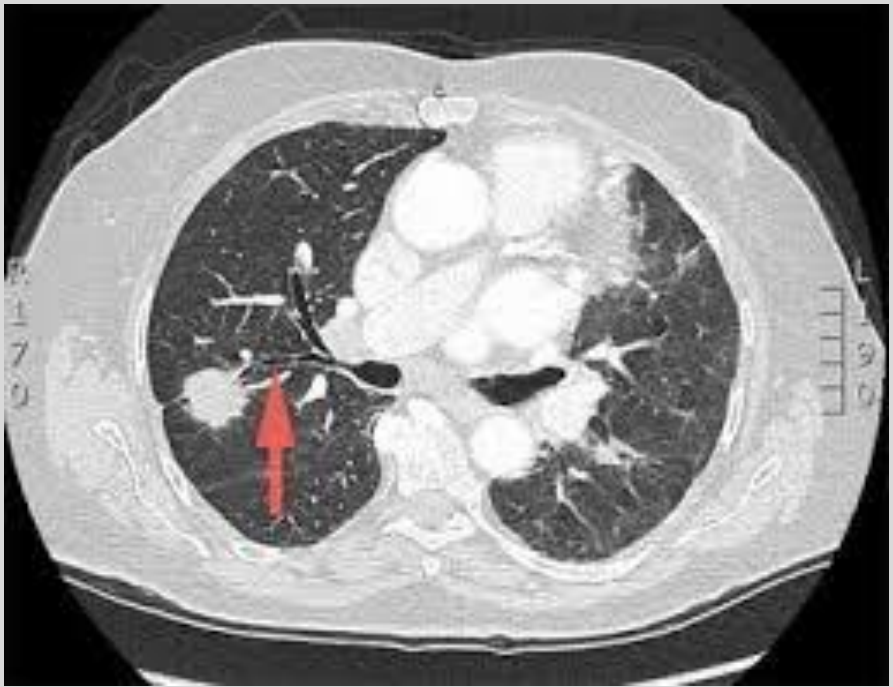


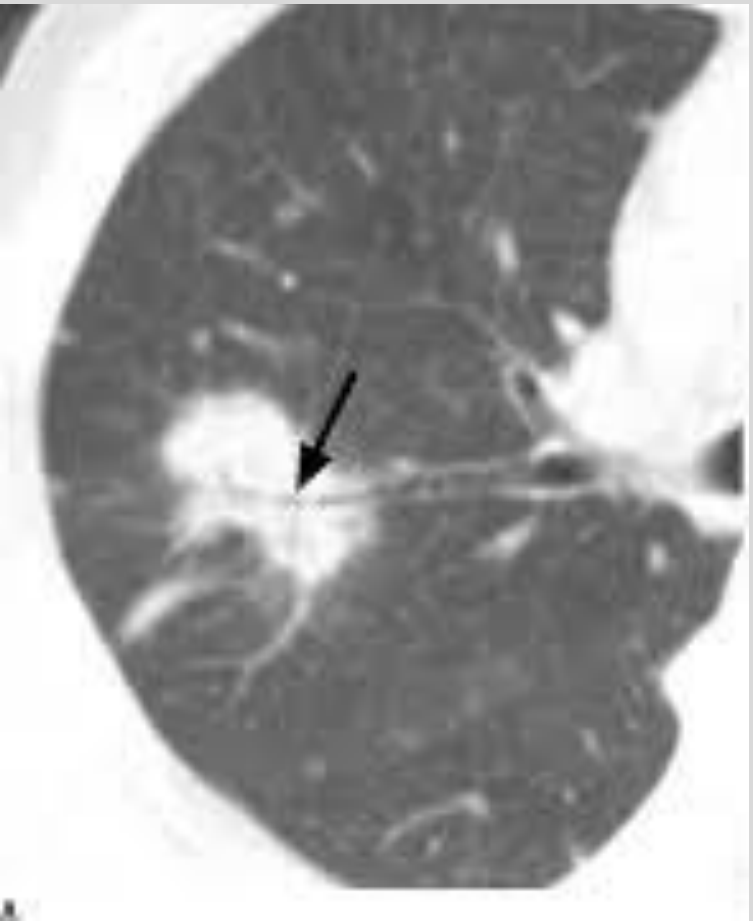
the importance of the positive bronchus sign inside a peripheral nodule:

prior to a possible bronchoscopy

this finding would be predictive of a diagnostic result of the examination itself

a **90% success** rate of **transbronchial biopsy** and brushing when a positive bronchus sign was identified





The hypoattenuation area may extend into the nodule producing an **air bronchogram**.

The bronchus sign is **not found** in all types of lesion, more frequently seen in masses (≥ 3 cm) and in those with **spiculated margins.**

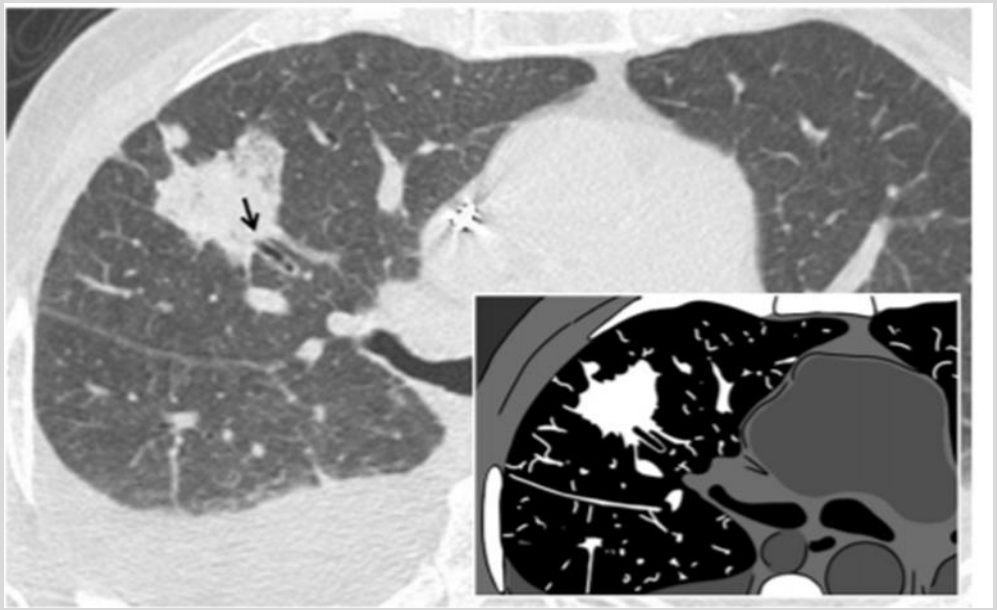
Several studies have shown that this sign is more often associated

with **malignant lesions**

and, in particular,

with pulmonary **adenocarcinoma**

with **lepidic pattern** and adenocarcinoma.




thank
you