Inflammatory pseudotumor: imaging features and
differential diagnosis

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Learning objectives

- To describe the radiologic features of inflammatory pseudotumor.
- To know the differential diagnosis of this lesion.
- To describe the various anatomic locations of the inflammatory pseudotumor on a series of 8 patients studied in our hospital.
Inflammatory pseudotumor, also called inflammatory myofibroblastic tumor, is a quasineoplastic lesion that consists of a mass with polymorphous inflammatory cell infiltrate and variable amounts of fibrosis, necrosis, granulomatous reaction and myofibroblastic spindle cells.

The organs most frequently affected by the inflammatory pseudotumor are the lung and the orbit but this lesion can be found in many anatomic locations.

They are difficult to recognize because they may clinically and radiologically mimic a malignant tumor. The recognition of the lesion, the fine-needle biopsy and histopathologic examination can avoid unnecessary surgical interventions.
Imaging findings OR Procedure details

From January 2008 to July 2012, 8 patients were diagnosed with inflammatory pseudotumor in our hospital (Universitary Hospital of Salamanca, Spain) in diverse anatomic locations. The study population consisted of 3 female patients and 5 male patients. We retrospectively reviewed the radiological reports of all these patients.

We observed four cases of pulmonary inflammatory pseudotumor, one of splenic involvement, one patient had an orbital tumor, one patient had a hepatic tumor, and one patient had middle-ear involvement.

The radiologic features of inflammatory pseudotumor are variable and nonspecific. In this review we will describe the main imaging features of the lesion according to its anatomical location.

**Pulmonary inflammatory pseudotumor**

Inflammatory pseudotumor of the lung is the most common primary lung mass in children (it makes up to 50% of benign pulmonary masses in children). This pathology is not sex-specific and is more common among patients in their second decade of life. In 50-70% of cases, this pathology is asymptomatic. Occasionally, the patients may report fever, cough, hemoptysis and dyspnea.

On plain radiographies, pulmonary inflammatory pseudotumor usually appears as a single, well-defined, lobulated mass with a predilection for peripheral locations and for the lower lobes. On CT images, findings are not specific. It can appear as a well-defined mass with an enhanced heterogeneous pattern after administration of intravenous contrast that can be associated with pleural effusion or atelectasis. Calcification can exist and it is more common in children than in adults (Fig. 1, Fig. 2 and Fig. 3).

On MRI, it presents intermediate signal intensity in T1-weighted images, high signal intensity on T2 and heterogeneous enhancement pattern after the administration of contrast.

The radiological differential diagnosis should include all the primary and secondary neoplasms; therefore, the first-choice treatment is the surgical resection of the lesion.

**Orbital inflammatory pseudotumor**

Orbital pseudotumor is the third most common primary tumor of the orbit and one of the most common causes of unilateral exophthalmos. It is not sex-specific and it can develop in patients of any age, but it is most common in middle age. The symptoms
include exophthalmos, acute pain, diplopia, ptosis, proptosis and ocular motility deficits. Inflammatory pseudotumor may involve any or all intraorbital structures. On CT and MRI orbital pseudotumor can appear as a uveal and scleral thickening or as a moderately enhanced mass that can be associated with bone destruction, intracranial extension, fat infiltration or edema.

MRI is the technique of choice for the study of this pathology. On MRI, orbital inflammatory pseudotumors are usually isointense to hypointense with regard to muscle on T1-weighted images and hypointense on T2, which is typical for most orbital masses. MRI with diffusion-weighted imaging can help to differentiate between malignant and benign lesions according to the apparent diffusion coefficient (ADC).

The diagnosis of orbital pseudotumor is frequently achieved by exclusion and it shows rapid resolution with corticosteroid treatment (Fig. 4 and Fig. 5).

**Inflammatory pseudotumor of the head and neck**

Although the most common locations for the inflammatory pseudotumor are the lung and the orbit, it can also be observed in the brain, sinonasal cavity, temporal bone or skull base. When inflammatory pseudotumor affects the sinonasal cavities it usually shows an aggressive appearance with bone changes such as erosion, sclerosis or remodeling.

Pseudotumors are very difficult to differentiate from neoplasms when they appear in the temporal bone or the skull base, because it usually appears as an infiltrating soft-tissue mass with bone destruction (Fig. 6 and Fig. 7).

**Spleenic inflammatory pseudotumor**

This kind of tumor most commonly affects middle-aged people and the symptoms seem to be correlated with the size of the tumor. Patients can report weight loss, fever or abdominal pain.

Epstein-Barr virus infection seems to be a possible cause of the tumor.

On ultrasound images, the inflammatory pseudotumor appears as a well-circumscribed, hypoechoic, single mass lesion. Non-enhanced CT shows a hypodense mass with or without calcification, and after the administration of contrast it shows a progressive enhancement of the lesion. It can be associated with the presence of a central stellate area of hypodensity that becomes hyperdense in a delayed phase and corresponds to a fibrous plaque.
On MRI, these lesions are hypo- to isointense on T1- and on T2-weighted images they show a central low intensity area that corresponds to the fibrous plaque. After the contrast administration the lesion presents a mild to moderate enhancement.

Radiologic findings cannot make a definitive diagnosis and the differential diagnosis should include lymphoma, hamartoma, hemangioma and metastases.

**Hepatic inflammatory pseudotumor**

Inflammatory pseudotumors of the liver usually appear as a large, solitary mass but they can appear as multiple masses in the same patient. The patients with this pathology generally report symptoms related to hepatic inflammation: fever, vomiting, epigastric pain and weight loss.

Although there are no specific imaging features for the hepatic pseudotumor and the differential diagnosis must include liver abscess, metastasis, peripheral cholangioma and hepatocellular carcinoma, there are some radiologic findings that distinguish it from hemangioma or hepatocellular carcinoma.

On ultrasounds, these lesions appear as hypoechoic or hyperechoic masses. On non-enhanced CT the lesions are usually hypodense in relation with the hepatic parenchyma, and after the administration of intravenous contrast they show hyperdensity on portal venous phase. Delayed enhancement is frequently observed, especially at the periphery, in relation to the fibrotic areas.

On MR images, these lesions are usually hypointense in relation to muscle on T1-weighted images, hyperintense on T2, and they show a heterogeneous enhancement pattern after administration of contrast.

Percutaneous biopsy should be performed to avoid unnecessary surgery when the clinical history and the radiologic findings suggest this kind of pathology.
Fig. 1: Figs. 1 and 2: Plain radiography (Fig. 1): a single, well-defined mass in the right upper lobe of lung. Chest CT scan (lung and mediastinal window) (Fig. 2): a soft tissue mass in the posterior segment of the right upper lobe that is associated with patchy areas of ground-glass opacity. Pathological examination revealed a pseudotumor.

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Fig. 3: Fig. 3: Chest CT scan (mediastinal window) demonstrates a soft tissue mass in the lingula with pleural effusion and atelectasis. Lobectomy revealed an inflammatory myofibroblastic tumor.

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Fig. 4: Figs. 4 and 5: Orbital inflammatory pseudotumor in a 75 year-old patient with diplopia and acute pain. Enhanced CT orbit scan (Fig 4) shows an infiltrating soft-tissue mass with bone destruction in the inner wall of the left orbit. This lesion produces diversion of the optic nerve towards the side and exophtalmos. It shows heterogeneous enhancement after the administration of contrast. CT orbit scan (Fig. 5) after corticoid treatment shows a radiological improvement of the lesion.
**Fig. 5:** Figs. 4 and 5: Orbital inflammatory pseudotumor in a 75 year-old patient with diplopia and acute pain. Enhanced CT orbit scan (Fig 4) shows an infiltrating soft-tissue mass with bone destruction in the inner wall of the left orbit. This lesion produces diversion of the optic nerve towards the side and exophtalmos. It shows heterogeneous enhancement after the administration of contrast. CT orbit scan (Fig. 5) after corticoid treatment shows a radiological improvement of the lesion.

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**Fig. 6:** Figs. 6 and 7: 8 year-old patient with inflammatory pseudotumor in the right middle-ear. Unenhanced axial CT scan of the temporal bones (Fig. 6): The image shows a bone erosion of the middle ear ossicles and the mastoid air cells. Contrast-enhanced axial T1-weighted MR (Fig. 7): image shows a hyperintense mass that is associated with bone destruction of the middle ear ossicles and mastoid air cells. Pathologic result was inflammatory myofibroblastic tumor.

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**Fig. 8:** Figs. 8, 9, 10 and 11: Color Doppler (Fig.8) imaging reveals a hypoechogenic splenic lesion with peripheral vascularization in a 61-year-old patient with a splenic inflammatory pseudotumor. Enhanced CT in arterial and portal phases (Figs. 9 and 10) show a mild enhancement of the lesion with a central stellate area of hypodensity. In a delayed post-contrast phase (Fig. 11) the lesion becomes isodense to the splenic parenchyma. The histopathologic examination reveals an inflammatory pseudotumor.

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**Fig. 9:** Figs. 8, 9, 10 and 11: Color Doppler (Fig.8) imaging reveals a hypoechogenic splenic lesion with peripheral vascularization in a 61-year-old patient with a splenic inflammatory pseudotumor. Enhanced CT in arterial and portal phases (Figs. 9 and 10) show a mild enhancement of the lesion with a central stellate area of hypodensity. In a delayed post-contrast phase (Fig. 11) the lesion becomes isodense to the splenic parenchyma. The histopathologic examination reveals an inflammatory pseudotumor.

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Fig. 10: Figs. 8, 9, 10 and 11: Color Doppler (Fig. 8) imaging reveals a hypoechogenic splenic lesion with peripheral vascularization in a 61-year-old patient with a splenic inflammatory pseudotumor. Enhanced CT in arterial and portal phases (Figs. 9 and 10) show a mild enhancement of the lesion with a central stellate area of hypodensity. In a delayed post-contrast phase (Fig. 11) the lesion becomes isodense to the splenic parenchyma. The histopathologic examination reveals an inflammatory pseudotumor.
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**Fig. 12:** Figs. 12, 13, 14, 15 and 16: Hepatic pseudotumor: Enhanced CT in arterial and portal phases (Figs. 12 and 13) shows a hypodense lesion in the caudate lobe (segment I) with a mild enhancement of the lesion and a central area of hypodensity. Axial T1 and T2 weighted MR images (Figs. 14 and 15) show a hypointense lesion in T1W that appears as hyperintense in T2W in the caudate lobe. After the administration of contrast (Fig. 16), it shows a very mild enhancement.
Fig. 13: Figs. 12, 13, 14, 15 and 16: Hepatic pseudotumor: Enhanced CT in arterial and portal phases (Figs. 12 and 13) shows a hypodense lesion in the caudate lobe (segment I) with a mild enhancement of the lesion and a central area of hypodensity. Axial T1 and T2 weighted MR images (Figs. 14 and 15) show a hypointense lesion in T1W that appears as hyperintense in T2W in the caudate lobe. After the administration of contrast (Fig. 16), it shows a very mild enhancement.

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Conclusion

Although it is a rare pathology and the imaging features of the inflammatory pseudotumor are nonspecific, radiologists should know the imaging findings of this lesion and they should include it in the differential diagnosis. The final diagnosis must be always histopathological and it can avoid unnecessary surgery in some instances.
References


