Imaging of Pulmonary Vasculature

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Introduction

- Many disease can affect the pulmonary vasculature ranging from large vessel disease such as aneurysm to capilliritis
- CT is the main diagnostic tool for evaluating the pulmonary vasculature
- Pulmonary angiography has limited use
- V/Q scanning remains an option for evaluating pulmonary thromboembolic disease
Objectives

• Recognize common imaging appearances of pulmonary vascular disease
• Learn the advantages and disadvantages of available imaging tools
• Use a case-based approach to pulmonary vascular disease
Case #1
Findings

- Axial CT images show filling defects in multiple subsegmental pulmonary artery branches
- Lung window image shows peripheral ground glass attenuation in RLL
Differential Dx

- Acute PE
- Chronic PE
- Tumor Thrombus (RCC, Head & Neck Tumors, Melanoma, etc.)
Diagnosis

- Acute Pulmonary Embolism with RLL infarction (Westermark Sign)
Case #2
Findings

- Axial CT image shows single filling defect in LLL subsegmental pulmonary artery branch
- Bilateral Pleural Effusions & Atelectasis (R>L)
Differential Dx

- Acute PE
- Chronic PE
- Tumor Thrombus (RCC, Head & Neck Tumors, Melanoma, etc.)
- Lymphadenopathy
- Artifact
Diagnosis

- Acute LLL Pulmonary Embolism in the setting of Congestive Heart Failure
Case #3
Findings

• Axial CT images show filling defects in multiple subsegmental pulmonary artery branches

• Enlargement of Right Heart
Differential Dx

- Acute PE
- Chronic PE
- PA Angiosarcoma
Diagnosis

- Acute Pulmonary Embolism (Shower Pattern) with Right Ventricular Strain
Case #4
Findings

• Selective Right PA Angiogram depicts filling defects in the right central and upper lobe pulmonary artery branches
Differential Dx

- Acute PE
- Chronic PE
- PA Angiosarcoma
Diagnosis

- Acute Pulmonary Embolism
Case #5
Findings

- V/Q scan showing multiple ventilation/perfusion mismatches
Differential Dx

- Acute PE
- Chronic PE
- Atelectasis
- Multifocal Pneumonia
Diagnosis

- High Probability V/Q Scan suggesting Acute Pulmonary Embolism
Case #6
Findings

• Axial CT images reveal multiple eccentric filling defects in subsegmental pulmonary artery branches

• Cardiomegaly and enlarged Main Pulmonary Artery
Differential Dx

- Acute PE
- Chronic PE
- Tumor Thrombus (RCC, Head & Neck Tumors, Melanoma, etc.)
Diagnosis

- Chronic Pulmonary Embolism
Case #7
Findings

- Chest radiograph shows symmetrically enlarged central pulmonary arteries
- Axial CT images depict eccentric filling defects in multiple subsegmental pulmonary artery branches
- Markedly Enlarged Pulmonary Arteries
Differential Dx

- Acute PE
- Chronic PE
- Tumor Thrombus (RCC, Head & Neck Tumors, Melanoma, etc.)
Diagnosis

- Chronic Pulmonary Embolism
Case #8
Findings

• Axial CT images show filling defects in multiple subsegmental pulmonary artery branches

• Corresponding PET images depict increased metabolic activity in regions of filling defects
Differential Dx

- Acute PE
- Tumor Thrombus (RCC, Head & Neck Tumors, Melanoma, etc.)
- PA Angiosarcoma
Diagnosis

- Pulmonary Artery Angiosarcoma
Case #9
Findings

• Axial CT images show filling defects in RUL pulmonary artery branches

• Lung window images depict peripheral tree-in-bud nodules in LUL and RLL

• Single CT image through upper abdomen shows exophytic mass extending from right kidney
Differential Dx

• Tumor Thrombus (RCC, Head & Neck Tumors, Melanoma, etc.)
• Acute PE
• Multifocal Infection (Fungal Pneumonia, etc.)
Diagnosis

- Hematogenous Tumor Spread from RCC
Case #10
Findings

- Lung window image shows RLL clustered nodules
- Sequential soft tissue windows reveal RLL systemic arterial supply
Differential Dx

- Pulmonary Varix
- Pulmonary Sequestration
- RLL Pneumonia
Diagnosis

- RLL Sequestration (Intralobar)
Case #11
Findings

- CXR shows subtle left basilar nodular opacity
- CT images demonstrate LLL air trapping and serpiginous vessels
Differential Dx

- Lobar Sequestration
- Congenital lobar emphysema
- LLL Pneumonia
Diagnosis

• Congenital Absence of Right Pulmonary Artery (Hypoplastic right lung)
Case #11
Findings

- CXR shows cardiomegaly and vague LLL nodule
- Lung window images depict LLL serpiginous vessels
Differential Dx

- Pulmonary Varix
- Pulmonary AVM
- Neoplasm
Diagnosis

- LLL Pulmonary AVM
Case #12
Findings

• Coronal Reconstructed CT image shows serpiginous vessels in LLL
Differential Dx

- Pulmonary Varix
- Pulmonary AVM
- Neoplasm
Diagnosis

- LLL Pulmonary Varix
Case #13
Findings

- **CXR** Demonstrates cardiomegaly and prominent central pulmonary arteries (LUL embolization coils)

- **CT** image shows numerous corkscrew vessels in both lungs as well as LLL patchy ground glass
Differential Dx

- LLL Pneumonia
- Pulmonary AVMs
- LLL Infarct (from acute PE)
Diagnosis

- Osler-Weber-Rendu (Hereditary Hemorrhagic Telangectasia)
Case #14
Findings

- CXR shows rounded retrocardiac opacities
- Axial CT images depict numerous serpiginous paraesophageal vessels
Differential Dx

- Varices
- Vascular neoplasm (sarcoma, etc.) extending from upper abdomen
- LLL Sequestration
Diagnosis

• Paraesophageal Varices (from portal hypertension secondary to Cirrhosis)
Case #15
Findings

- CT images show prominent central pulmonary arteries as well as scattered, mild interlobular septal thickening
Differential Dx

- Congestive Heart Failure
- Pulmonary Hypertension
- Capillary Hemangiomatosis (PCH)
- Veno-Occlusive Disease (PVOD)
Diagnosis

- Pulmonary Veno-Occlusive Disease (PVOD)
Case #16
Findings

- CXR demonstrates cardiomegaly, prominent central pulmonary arteries and diffuse nodular opacities
- CT images show numerous centrilobular nodules as well as scattered, patchy ground glass
Differential Dx

- Multifocal Pneumonia
- Pulmonary Hypertension
- Capillary Hemangiomatosis (PCH)
- Chronic PE
Diagnosis

- Pulmonary Capillary Hemangiomatosis (PCH)
Case #17
Findings

- CXR demonstrates asymmetric left hilar prominence (? central pulmonary arteries)
- CT image depicts focal stenotic narrowing of the proximal left pulmonary artery with associated post stenotic dilatation
Differential Dx

- Pulmonary Hypertension
- Pulmonary Valve Stenosis
- Behcet’s Disease
- Pulmonary Artery Aneurysm
Diagnosis

- Behcet’s Disease
Case #18
Findings

- CT images reveal fenestrated filling defect involving RLL pulmonary artery
Differential Dx

- Acute PE
- Chronic PE
- Pulmonary artery aneurysm
- Pulmonary artery dissection
Diagnosis

- Pulmonary artery dissection (iatrogenic - after difficult Swan-Ganz placement)
Case #19
Findings

- CT image reveals abnormal vessel wrapping around left mainstem bronchus
Diagnosis

• Pulmonary Sling
Case #20
Findings

- Single CT images reveal reflux of contrast into the azygous vein
Differential Dx

- Venous fistula (iatrogenic)
- PAPVR
Diagnosis

- PAPVR
Findings

- CXR shows right hemithorax volume loss and paucity of right lung vessels
- CT images demonstrate no right pulmonary artery
Differential Dx

- Normal variant
- Congenital Absence of Right Pulmonary Artery (Hypoplastic right lung)
Diagnosis

• Congenital Absence of Right Pulmonary Artery (Hypoplastic right lung)
Case #22
Case #23
Findings

- CXR shows vertical vessel in right lung base with associated hemithorax volume loss
- CT images reveal anomalous vasculature in RLL
Differential Dx

- Scimitar Lung (Partial Anomalous Pulmonary Venous Return - PAPVR)
- Pulmonary Varix
- Hypoplastic Right Lung
Diagnosis

- Scimitar Lung (Partial Anomolous Pulmonary Venous Return - PAPVR)
Findings

- Coronal Reconstructed CT image demonstrates anomalous vasculature in hemithorax
Differential Dx

- Scimitar Lung (Partial Anomalous Pulmonary Venous Return - PAPVR)
- Pulmonary Varix
- Hypoplastic Right Lung
Diagnosis

• Scimitar Lung (Congenital Venolobar Syndrome)
Case #25
Findings

- Multiple CT images reveal multifocal ground glass and scattered foci of subpleural reticulation
Differential Dx

- Fungal Pneumonia (Low-grade)
- Vasculitis
- Early fibrosis
Diagnosis

- Churg-Strauss (Vasculitis)
Case #26
Case #27
Findings

- CT images reveal multiple thin-walled cavities in both lungs
Differential Dx

• Pulmonary metastasis (RCC, Sarcoma, etc.)
• Cavitary pneumonia (fungal or bacterial)
• Vasculitis (Wegener’s)
• Septic Emboli
Diagnosis

- Wegener’s Granulomatosis
Case #28
Findings

• CT image shows multiple thick-walled cavities in both upper lungs
Differential Dx

- Pulmonary metastasis (RCC, Sarcoma, etc.)
- Cavitary pneumonia (fungal or bacterial)
- Vasculitis (Wegener’s)
- Septic Emboli
Diagnosis

- Wegener’s Granulomatosis
Case #29
Findings

- CXR depicts near complete right hemithorax opacification and left perihilar opacity
- CT image shows diffuse right lung ground glass attenuation & LUL non-dependent consolidation
Differential Dx

- Pulmonary lymphoma/leukemia
- Multifocal pneumonia (fungal or bacterial)
- Vasculitis (Wegener’s)
- COP (Cryptogenic Organizing Pneumonia)
Diagnosis

- Wegener’s Granulomatosis
Case #30
Findings

- CXR demonstrates patchy bibasilar opacities
- CT images depict multifocal ground glass primarily in the lung bases
Differential Dx

• Pulmonary hemorrhage
• Pulmonary edema
• Pulmonary contusion
• Multifocal Pneumonia
Diagnosis

• Pulmonary hemorrhage due to Goodpasture’s Disease (renal-pulmonary disease)
Summary

• Imaging manifestations of pulmonary vascular disease are numerous

• CT is the imaging tool of choice for evaluating the pulmonary vasculature

• CT findings of vasculitis are non-specific and can mimic infection and neoplasm