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IV Heroin Drug Use: A Compendium of Biomedical and Social Radiological Findings

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Objectives

1. Menu of Tests and Their Efficacious Use
2. Anatomy
3. Image Interpretation
4. Differential Diagnoses
5. Discussion
 1. Conclusions
 2. Towards a Social Radiology



Our Patient: Clinical Presentation

- Patient: Male war veteran in his 30's with history of PTSD
- HPI: Presents to ED with respiratory and cardiac arrest. Urine screen positive for opiates.



Before we hear more about our patient, let's review some common complications of IV heroin use.



IV Heroin Use: Some Complications

NEUROLOGICAL

- Ischemia/infarction secondary to CNS depression

PULMONARY

- Pneumonia: Aspiration, PCP (secondary to HIV co-infection)
- Talcosis
- TB

CARDIOVASCULAR

- Bacterial endocarditis and mycotic emboli



IV Heroin Use: Some Complications (Cont.)

DERMATOLOGIC

- Chronic abscesses and scarring due to repeated injection (‘skin popping’)
- Cellulitis

RHEUMATOLOGIC

- Osteomyelitis
- Septic arthritis

LIVER & SPLEEN

- Abscesses
- Chronic hepatitis (B and C)



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IV Heroin Use: Check ACR Appropriateness Criteria

American College of Radiology ACR Appropriateness Criteria®

Clinical Condition: Suspected Infective Endocarditis

Radiologic Procedure	Rating	Comments	<u>RRL*</u>
US echocardiography transthoracic resting	9	This is the preferred modality.	0
X-ray chest	8	This procedure is useful for monitoring cardiopulmonary status.	⊕
US echocardiography transesophageal	8	This invasive procedure is used when better definition of anatomy is required.	0

For suspected infective endocarditis, for example, ACR recommends transthoracic echo as the first imaging modality.



IV Heroin Use: Menu of Tests and Their Efficacious Use

- **Neurologic:** MRI head w/ and w/o contrast - DWI/ADC for ischemia
- **Pulmonary:** CXR (if equivocal: CT w/o contrast)
- **CV:** Echo; CTA abdomen w/ contrast for suspected abdominal emboli/ischemia
- **Dermatologic:** Imaging usually unnecessary
- **Rheumatologic:** X-Ray
- **Liver/Spleen:** US (if equivocal: CT abdomen w/ contrast)



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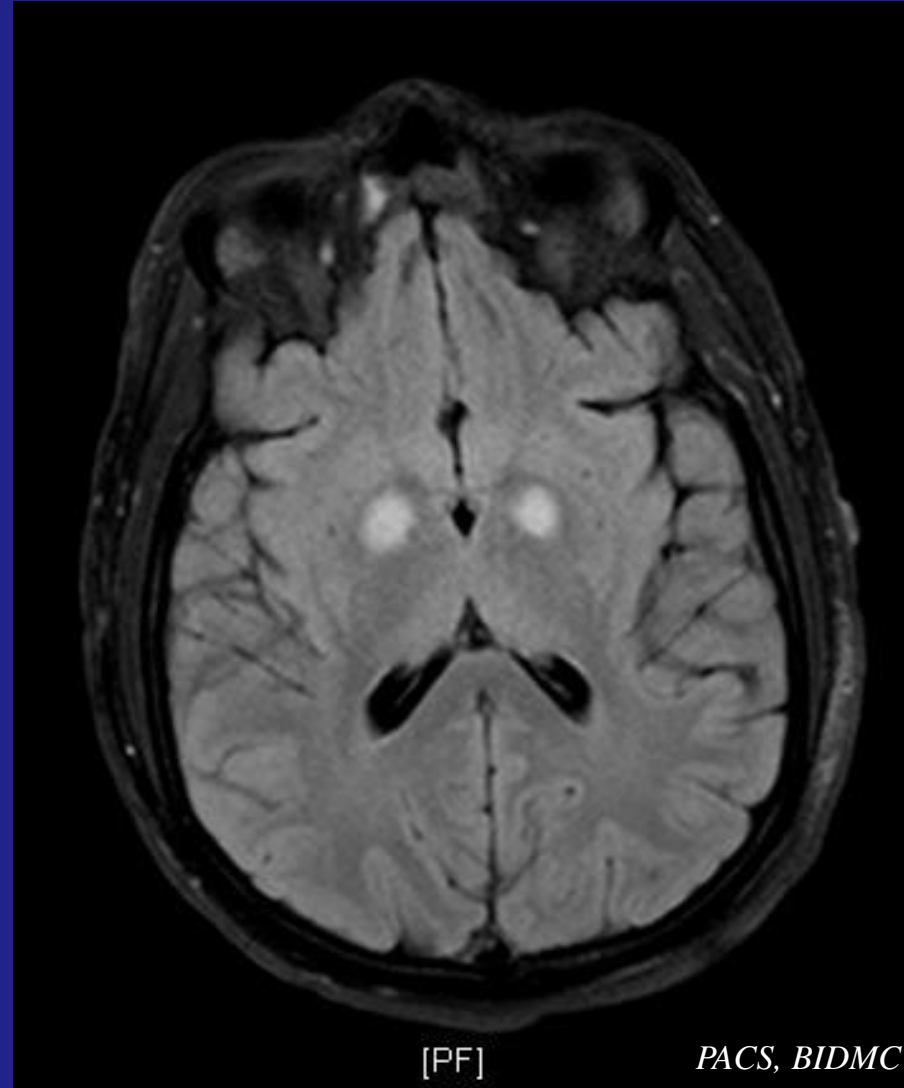
Our Patient

Mr. X was resuscitated after his arrest, but he showed neurological defects. Let's continue to review findings on his brain MRI.

Our Patient: Globus Pallidus Hypoxia on MRI

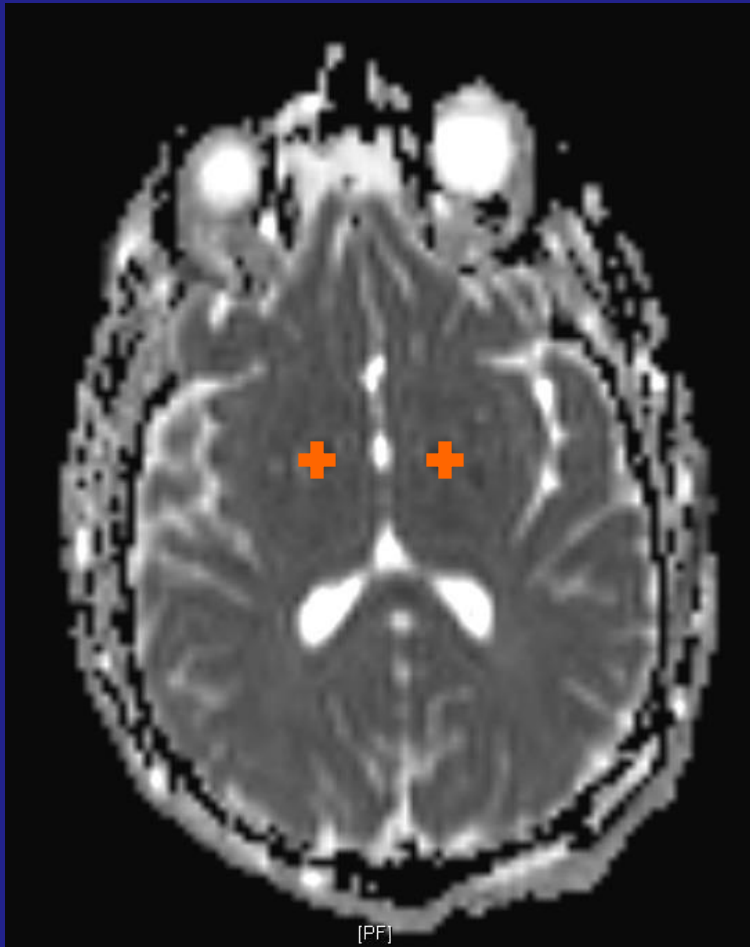


C- AXIAL ADC BRAIN MRI

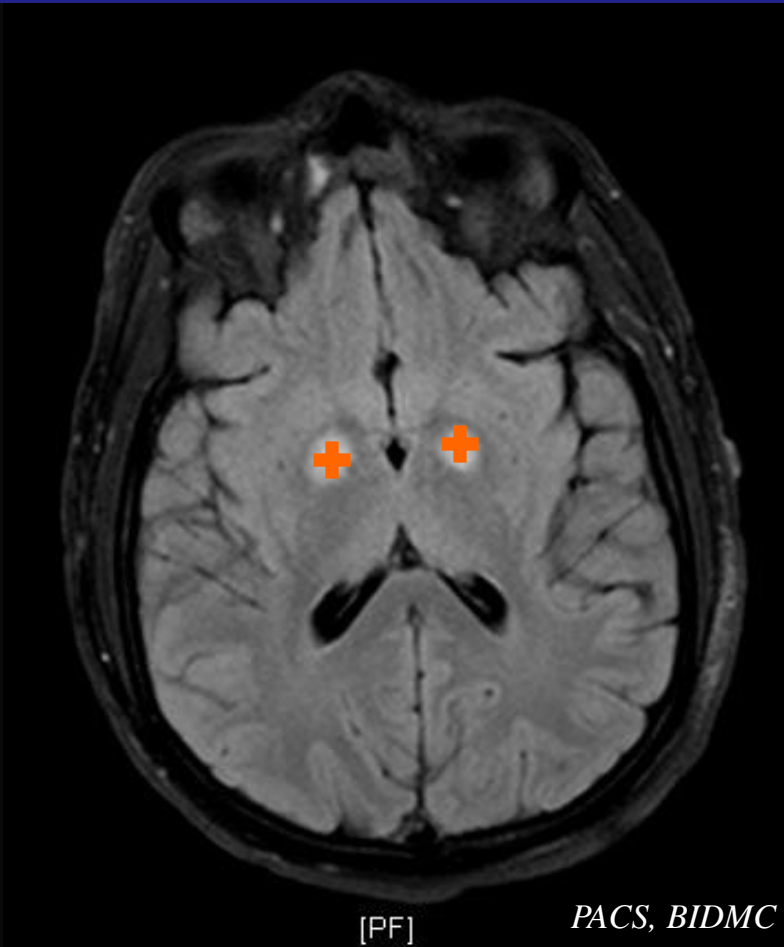


C- AXIAL DWI BRAIN MRI

Our Patient: Globus Pallidus Hypoxia on MRI



C- AXIAL ADC BRAIN MRI



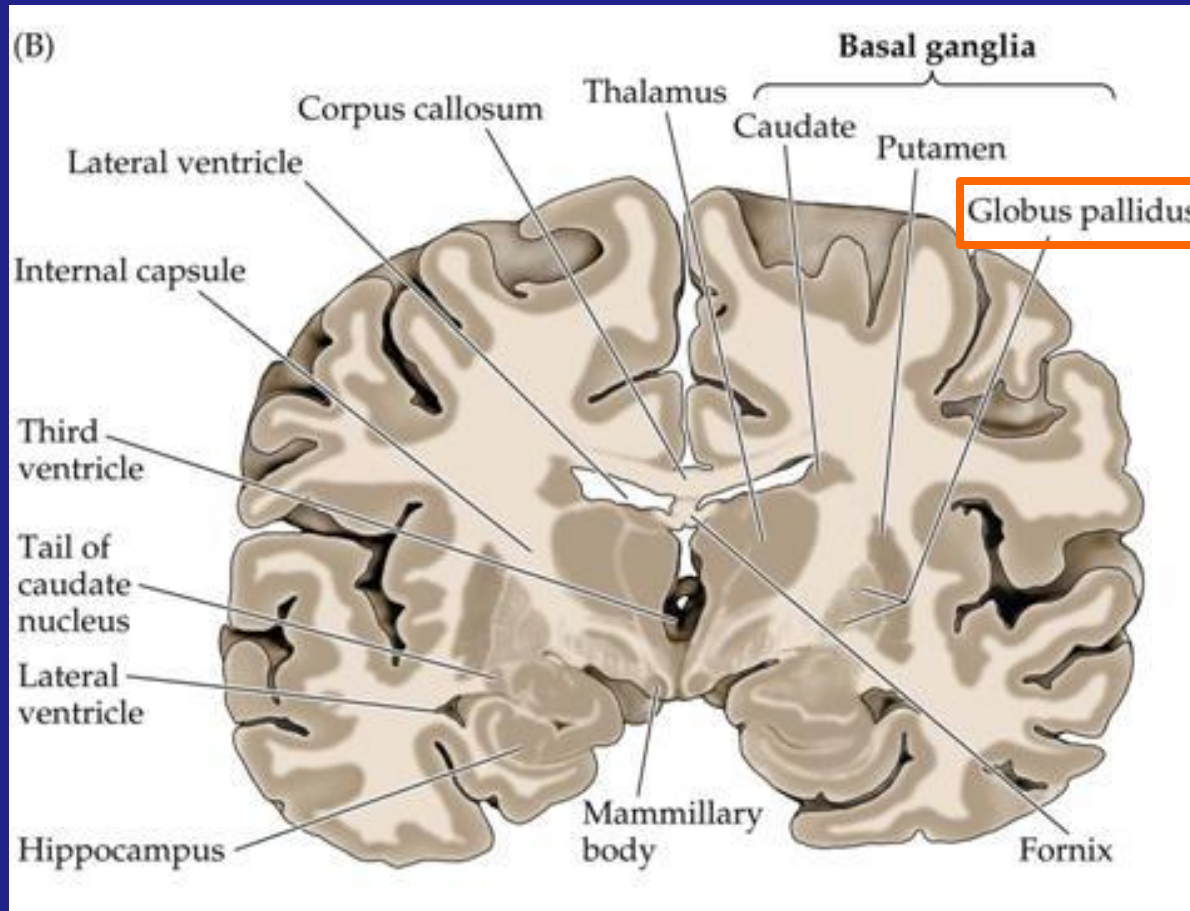
C- AXIAL DWI BRAIN MRI

PACS, BIDMC

Restricted diffusion at
globus pallidus bilaterally



Our Patient: Global Pallidus Anatomy





Differential for Cerebral Infarction

- Arterial occlusive disease
- Anoxic ischemic encephalopathy due to acute respiratory insufficiency
 - CO intoxication
 - **Cardiac failure**
 - **Drug overdose**
- Venous thrombosis



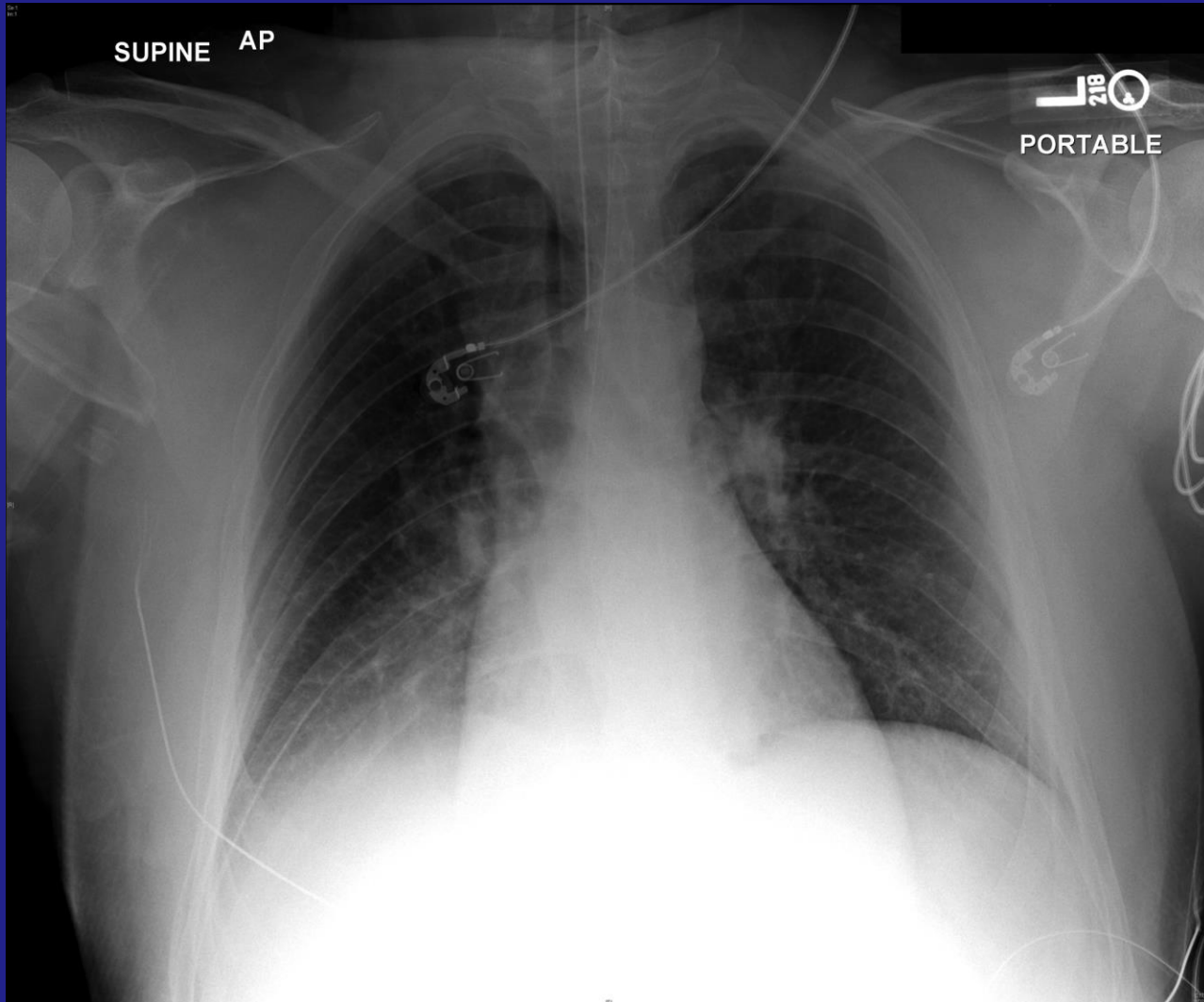
Our Patient

Unfortunately, this was not Mr. X's only problem.

He had originally been found unconscious after an indeterminate period of time.

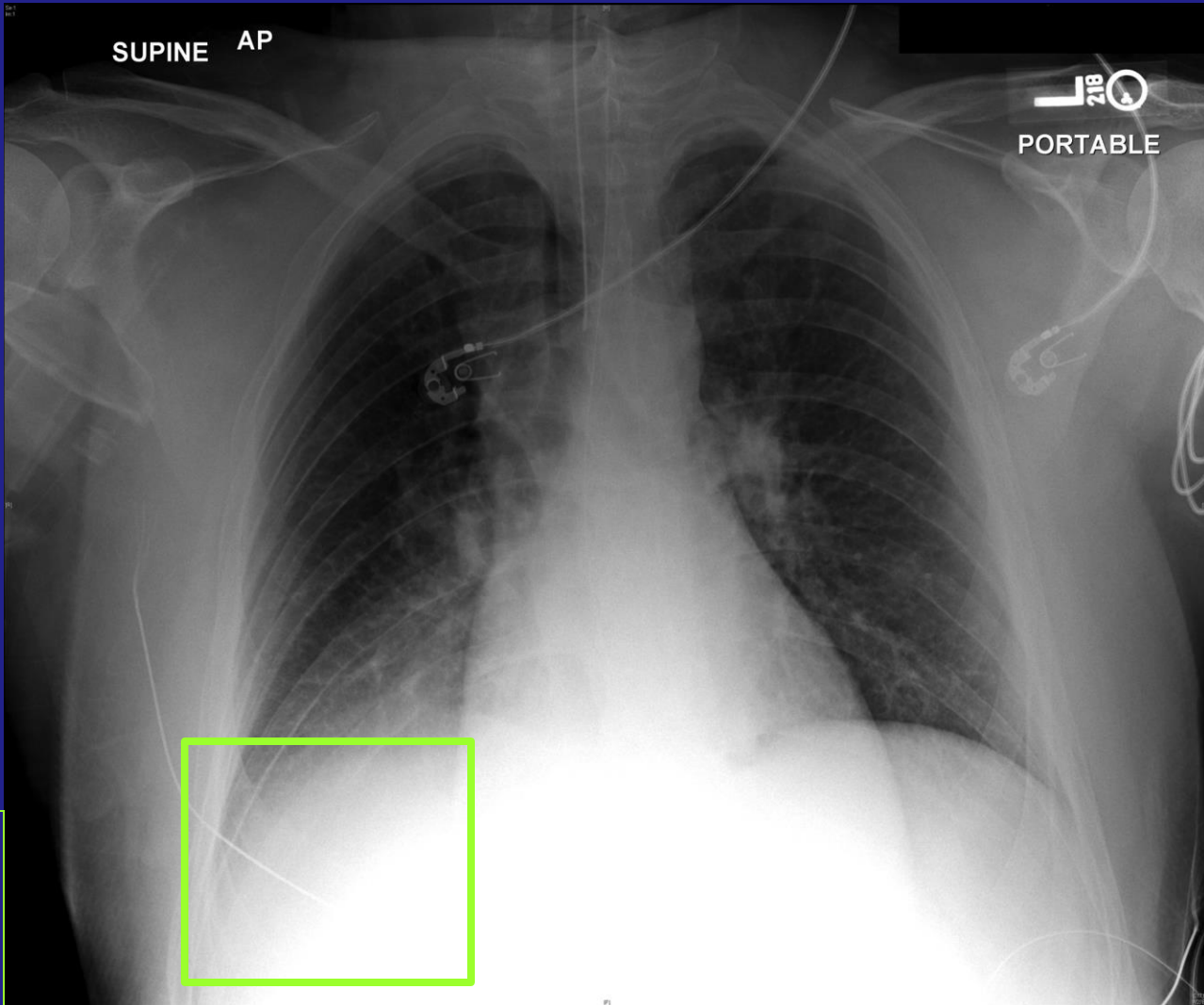
What might we expect to find in his lungs?

Our Patient: What is the Finding on CXR?



SUPINE AP CHEST PLAIN FILM

Our Patient: *Aspiration Pneumonia*



RLL opacity
suggestive
of aspiration
pneumonia

SUPINE AP CHEST PLAIN FILM



Differential for Localized Consolidation

- **Aspiration pneumonia**
- Atelectasis
- Contusion
- Edema, localized
- Obstructive pneumonia



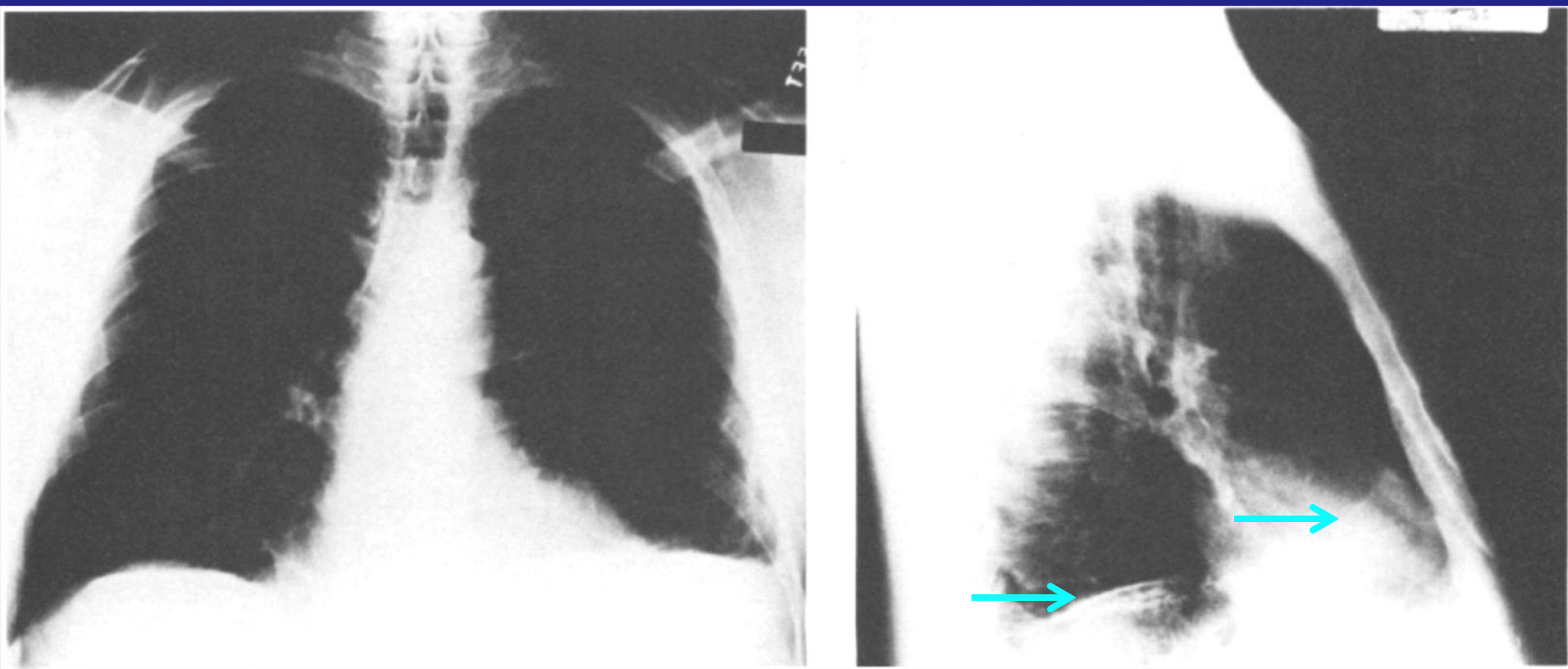
Our Patient

Our patient demonstrated globus pallidus hypoxia and aspiration pneumonia.

Let's continue to review some companion patients with different complications of IV heroin use.



Companion Patient #1: Talcosis on CXR



UPRIGHT PA AND LATERAL CHEST PLAIN FILM

Bilateral calcified
pleura

Davis LL. Pulmonary "Mainline" Granulomatosis: Talcosis Secondary to Intravenous Heroin Abuse with Characteristic X Ray Findings of Asbestosis. Journal of the National Medical Association 1983; 75(12): 1225-1228.

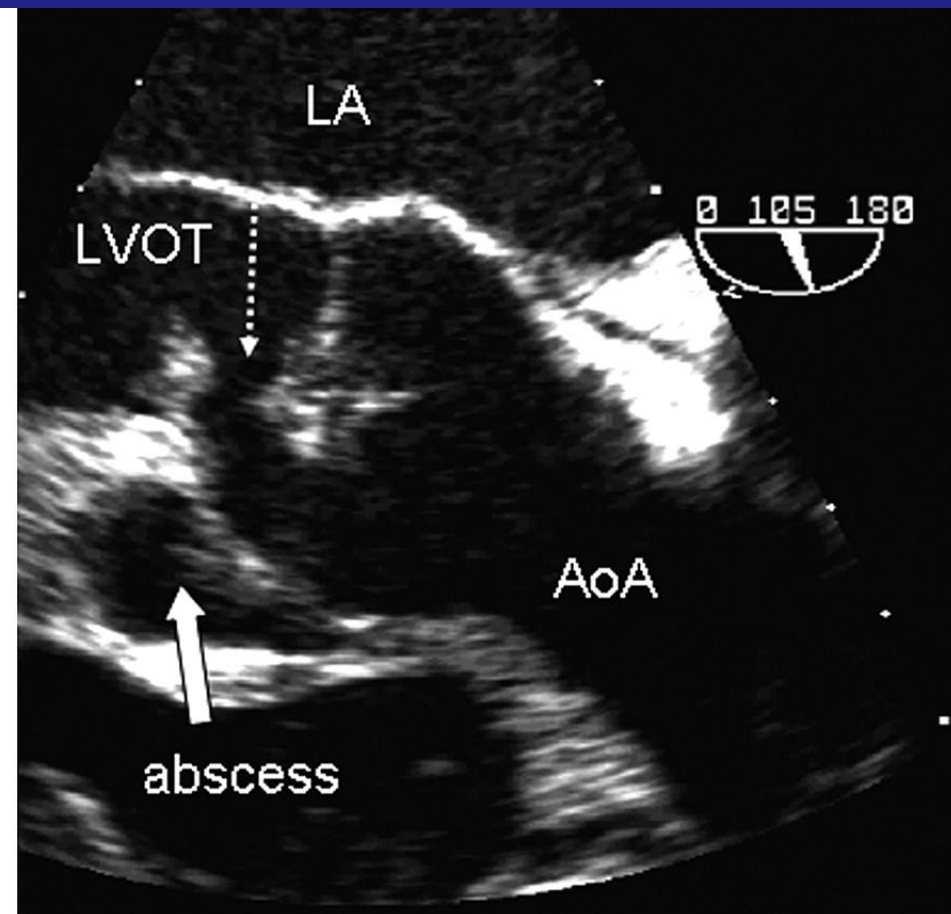
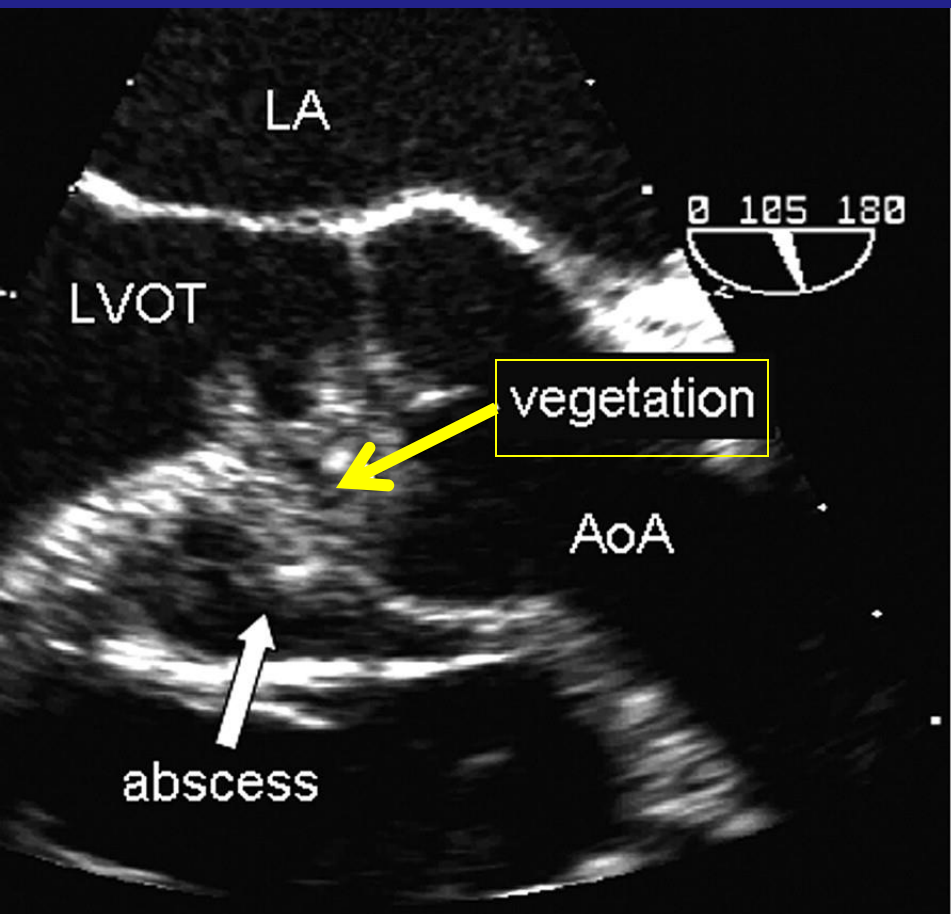


Differential for Pleural Calcification

- Asbestos
- Chronic empyema
- Idiopathic
- TB
- Other pneumoconiosis (mica, **talc**, other silicates, tin, barium)

*Talcum powder is used as a filler in street heroin.
Exposure can result in fibrosis and lung stiffening.*

Companion Patient #3: Bacterial Endocarditis on US

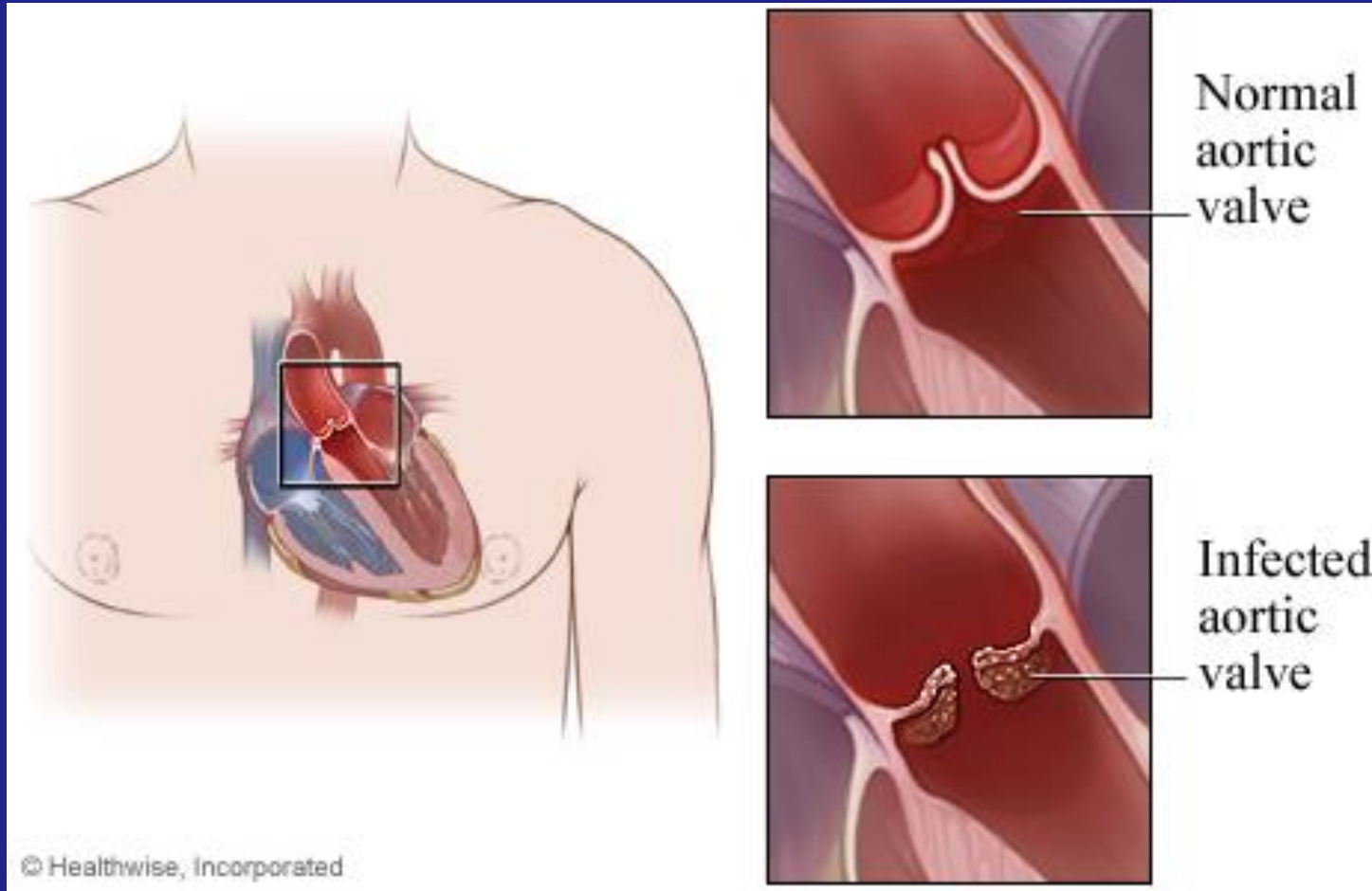


Vegetation on
aortic valve

LONG AXIS ECHOCARDIOGRAM

Kuhl HP, Hanrath P. The impact of transesophageal echocardiography on daily clinical practice. Eur J Echocardiography 2004; 5: 455-468.

Companion Patient #3: Endocarditis Anatomy





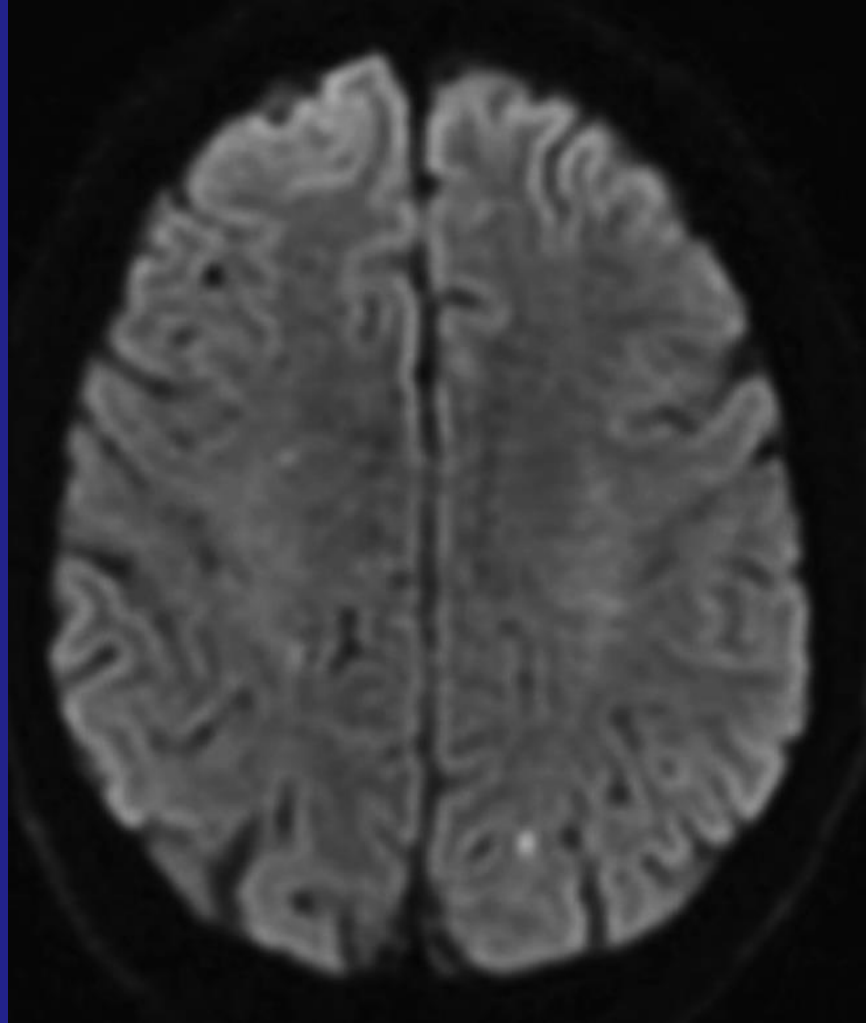
Differential for Common Cardiac Conditions Diagnosed by Echo

- Aortic stenosis or insufficiency
- **Bacterial endocarditis**
- Cardiac tumor
- Mitral stenosis or insufficiency
- MVP
- Pericardial effusion

IV drug users are at risk for hematogenous infections. Infectious agents enter through injection sites and seed throughout the body, including heart valves.

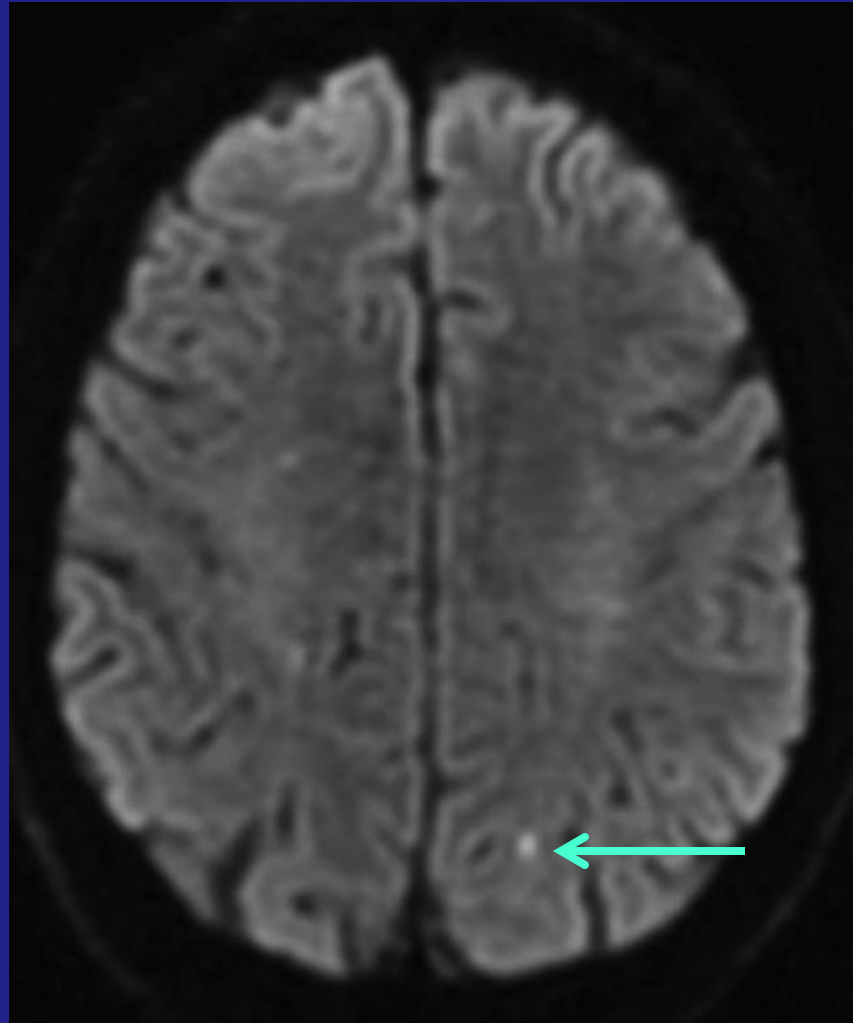
Companion Patient #4:

What is the Finding on Brain MRI?



AXIAL T2 WEIGHTED TRACE BRAIN MRI

Companion Patient #4: *Mycotic Embolus*



Mycotic embolus

AXIAL T2 WEIGHTED TRACE BRAIN MRI



Differential for Embolus

- Atheromatous plaque or ulcer with mural thrombus
- **Bacterial endocarditis**
- Iatrogenic
- Septic
- Venous thrombosis

Valvular vegetations can dislodge as septic emboli and cause ischemia and/or infarct in other parts of the body.



Companion Patient #4: Clinical Course

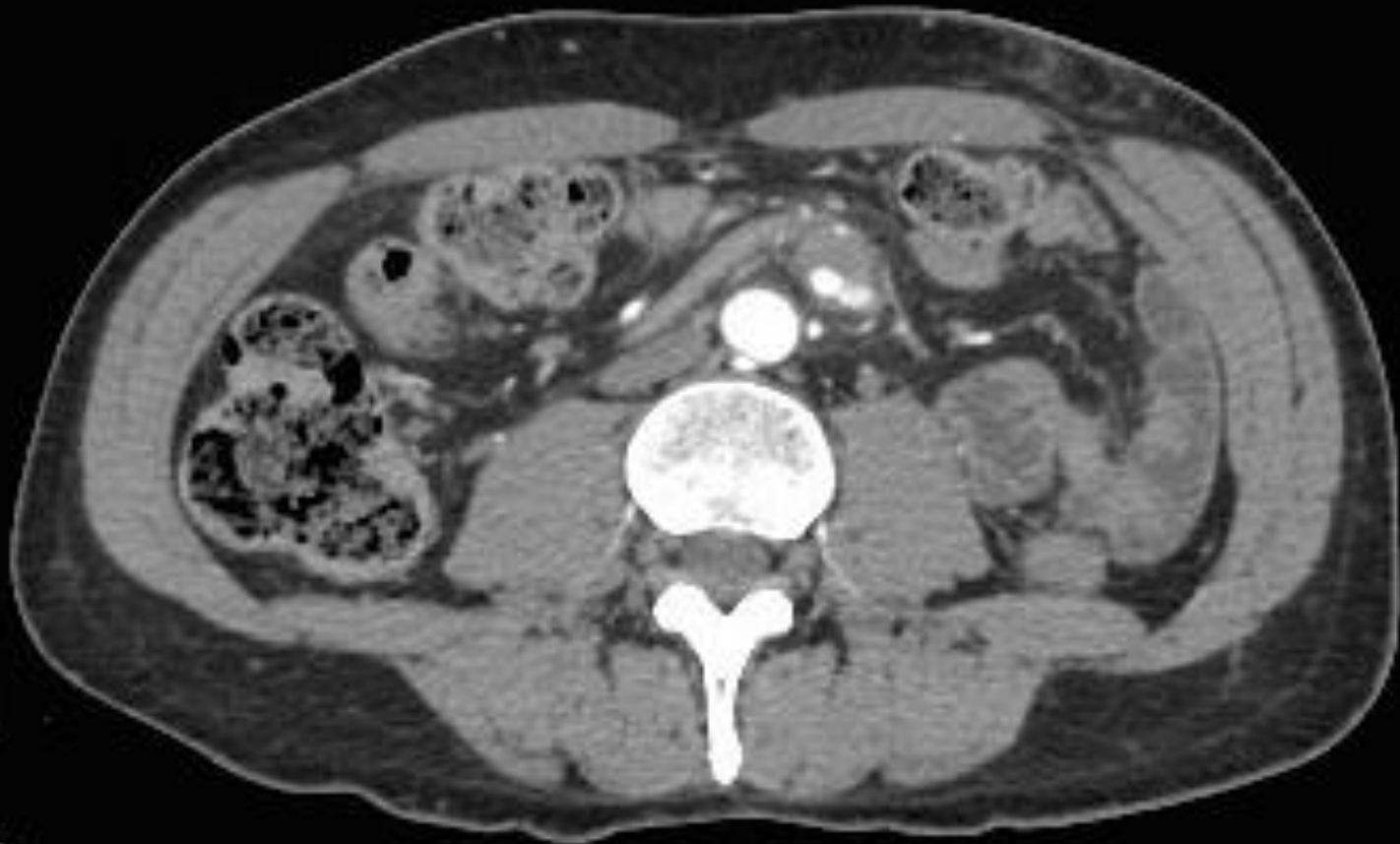
Three months after the mycotic embolus to the brain, our companion patient #4 returns to the hospital with peri-umbilical pain, nausea, and vomiting.

An abdominal CT with contrast is performed.
What might we expect to find?

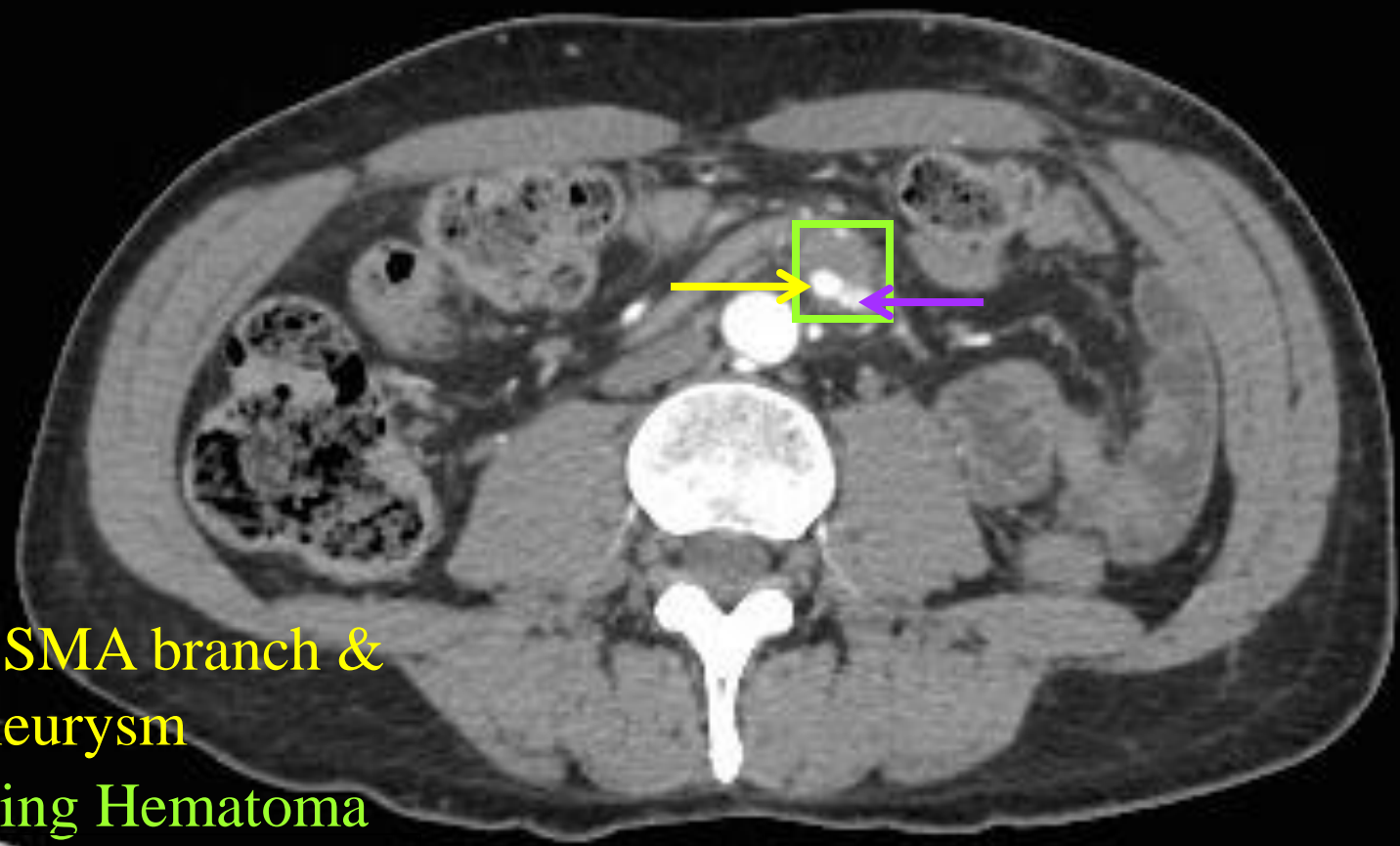


Companion Patient #4:

What is the finding on abdominal CT?



Companion Patient #4: *Mycotic Pseudoaneurysm*



2nd order SMA branch &
pseudoaneurysm
Surrounding Hematoma
Contrast Extravasation



Companion Patient #4: Clinical Outcome

This patient threw another embolus to an SMA branch, which infected the vessel wall. The wall burst and bled, resulting in an unstable mycotic pseudoaneurysm.

A hematoma formed to attempt to contain the leakage, but some contrast still managed to extravasate.

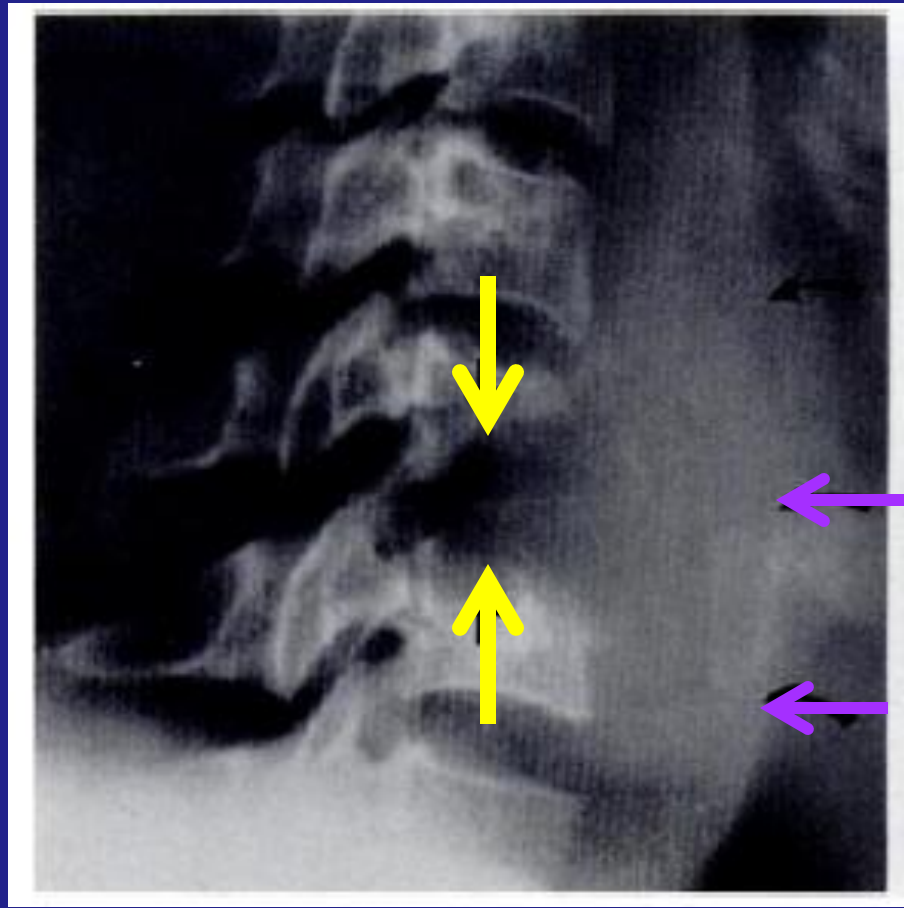
The pseudoaneurysm was resected through emergent surgery.



Differential for Aneurysm

- Atherosclerosis
- Congenital
- Dissecting
- Trauma (including **false aneurysm**)
- Mycotic aneurysm (sepsis, **bacterial endocarditis**, tuberculosis)

Companion Patient #5: Cervical Osteomyelitis



CERVICAL SPINE PLAIN FILM

Destruction of
C5/C6 with disc
space infection

Prevertebral
abscess

Endress C, Guyot DR, Fata J, Saliccioli G. Cervical Osteomyelitis due to IV Heroin Use: Radiologic Findings in 14 Patients. AJR 1990; 155: 333-335



Differential for Infectious Lesion of Bone

- Blastomycosis
- Brodie's abscess
- Coccidioidomycosis
- Cystic osteomyelitis
- Histoplasmosis
- TB

*Cervical osteomyelitis is not an uncommon complication among long-standing IV heroin users. **S. aureus** is a common causative organism.*



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Our Patient: Outcome

Mr. X was treated with a course of antibiotics for aspiration pneumonia.

He improved neurologically, regaining full motor function.

He was discharged with a plan that included substance abuse counseling.



Our Patient: Conclusions

- IV heroin drug use is associated with a variety of complications. You were shown images of some of these complications, including:
 - Brain hypoxia
 - Aspiration pneumonia
 - Talcosis
 - Bacterial endocarditis
 - Mycotic embolus
 - Mycotic pseudoaneurysm
 - Cervical osteomyelitis

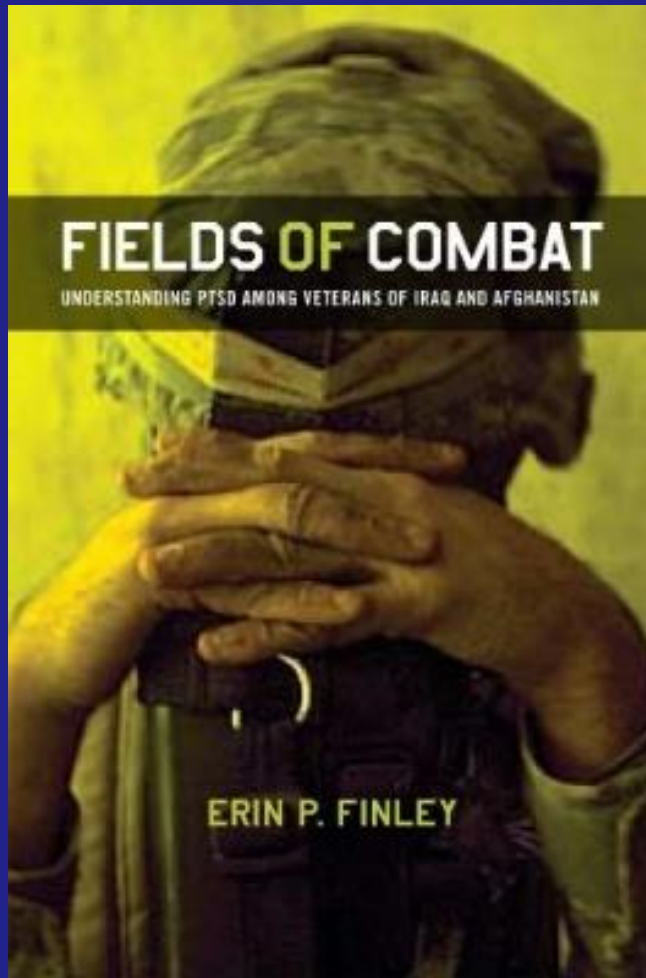


Our Patient: Towards a Social Radiology

- What **caused** Mr. X's globus pallidus hypoxia and aspiration pneumonia?
 - Biomedical Analysis*: opioid overdose
 - Social Medical Analysis*: violence of war
- How do we **interpret** images?
 - Radiology is an art of symbolic interpretation, with different styles, including:
 - Biomedical
 - **Sociosomatic**



Our Patient: Ethnographic Context



- Mr. X was a war veteran suffering from PTSD.
- Though his war experience is unknown, many former soldiers experienced trauma around acts of killing.
- Their disease has not only a biomedical basis, but also a socio-political basis.



Our Patient: Social Imaging

A ‘social radiology’ might take these histories, politics, and stories into account in medical evaluation and diagnosis.

As a style of radiology, it could develop its own interpretative frameworks to complement existing biomedical interpretations.

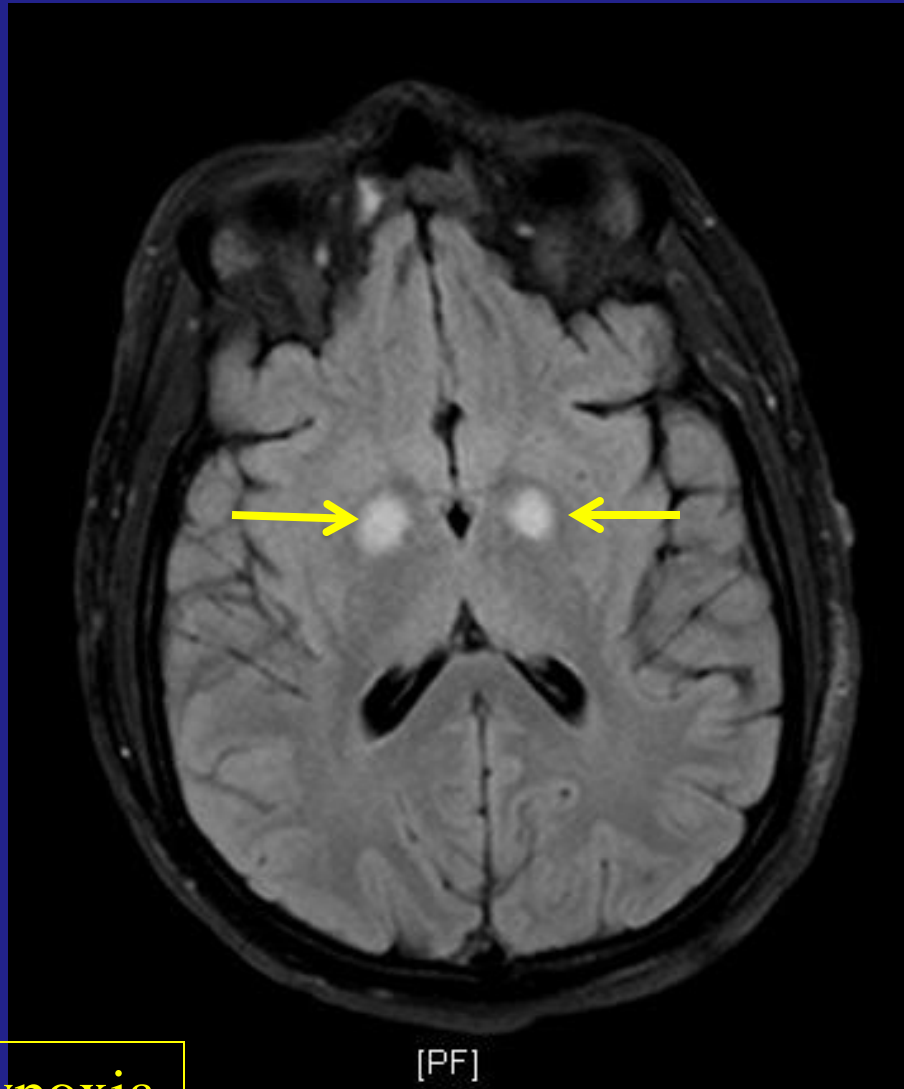
Let’s continue to view a possible social radiological MRI reading for our patient.



Our Patient: A Social MRI Reading

- **EXAMINATION:** Neuropolitical MRI, w/ and w/o contrast
- **INDICATION:** Brain damage secondary to PTSD after Iraq War
- **TECHNIQUE:** MRI w/ and w/o contrast, psychosocial view
- **COMPARISON:** MRI w/ and w/o contrast, radiological view
- **FINDINGS:** Bilateral hypoxic changes consistent with heroin overdose. Sociopolitically consistent with PTSD of depressed soldier.
- **IMPRESSION:** Bilateral globus pallidus hypoxia suggesting suffering of war. Follow-up veteran support is recommended. Broader politics of oil and technologies of killing need re-examination.

Our Patient: Biomedical Read

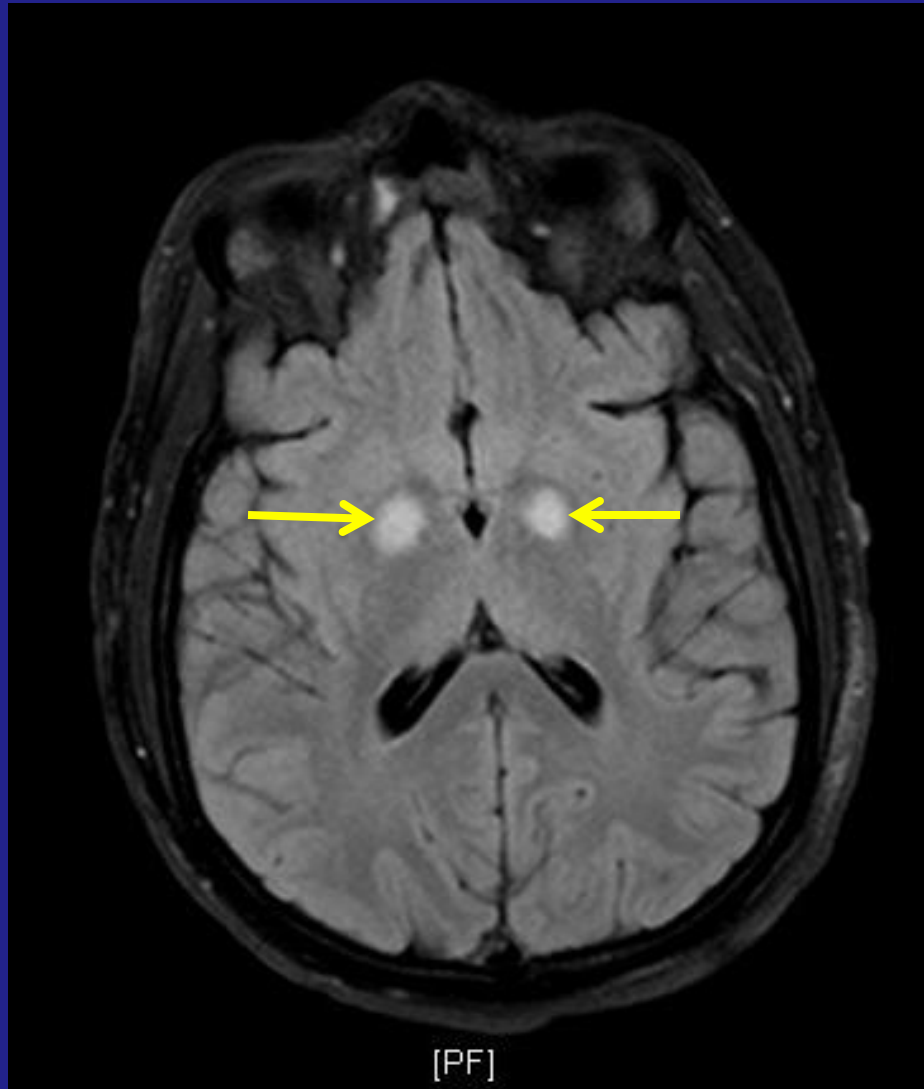


[PF]

C- AXIAL DWI BRAIN MRI

Globus pallidus hypoxia

Our Patient: Social Read



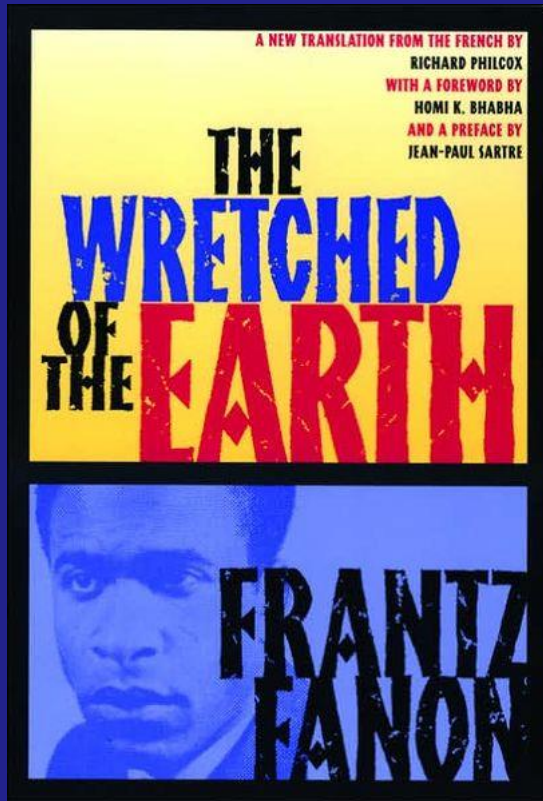
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C- AXIAL DWI BRAIN MRI

Violence of war



Radiology and Political Economy



“The criminality of the Algerian, his impulsiveness, the savagery of his murders are not, therefore, the consequences of how his nervous system is organized...but the direct result of the colonial situation.”

- Dr. Frantz Fanon, critiquing biomedical approaches to Algerian suffering that couched it in terms of nervous and psychiatric disorders – rather than as the direct result of the violence of French colonialism.



Radiology as Imaged Politics

- *How could we begin to integrate political economy and history with radiology?*
 - Incorporating anthropologists, historians, and philosophers into clinical teams.
 - They could provide the knowledge to give us a precise third eye to read in images the politics which are currently being missed in biomedical reads.
 - Bringing social science and radiology together could produce better outcomes for our patients.



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