

Introduction

- A Pulmonary Embolism (PE) is a potentially life-threatening condition that occurs when blood clots within the pulmonary artery.
- Computed Tomography (CT) is considered the first line of defense in detection of a PE due to its quick scan time, resulting in a quick diagnosis.
- A CT scan is preferred because of its accuracy, quick turnaround time, great spatial resolution, and multiplanar reconstruction capabilities (Palm et al., 2020, para. 15).

PE Statistics

- 5-10% of in-hospital deaths are attributed to PE's (Hammer & McPhee, 2019, p. 277).
- Approximately 95% of pulmonary emboli (PE) arise from the thrombi in the lower extremities (Hammer & McPhee, 2019, p. 277).
- Pulmonary emboli contribute to roughly 300,000 deaths per year in the US. (Zantonelli et al., 2022, para. 2).
- The mortality rate of a PE is approximately 10-30% (Palm et al., 2020, para. 13).
- In about 73% of confirmed cases of PE, patients experienced dyspnea (Hammer & McPhee, 2019, p. 281).

Computed Tomography

- CT is an imaging modality that takes spiral or helical cross section images of the body using a rotating x-ray tube and detector system to provide a visual demonstration of internal structures.
- Cross section images are taken in three planes:
 - Coronal
 - Axial
 - Sagittal
- CT is considered the most effective method for diagnosing a PE.



CT Scanner

(Mayo Clinic, 2022)

Pulmonary Embolism

- A PE is a serious life-threatening condition that, if untreated, can lead to complications, or death.
- A PE occurs when a thrombus breaks free from another location in the venous system, and travels into the pulmonary artery (DeMaio, 2017, p. 46).
- The pulmonary artery becomes blocked and restricts the flow of blood to the lungs.
- PEs are the third most frequently occurring cause of cardiovascular death behind a stroke and myocardial infarction (Zantonelli et al., 2022, para. 2).
- There are several types of pulmonary emboli, with the most common PE being a pulmonary thromboembolism (Hammer & McPhee, 2019, p. 277).
- A pulmonary thromboembolism occurs when venous thrombi, typically from the lower extremities, enters circulation into the pulmonary artery.

Symptoms

- Dyspnea (Danielsbacka et al., 2021, para. 18)
- Pleuritic chest pain (Hammer & McPhee, 2019, p. 281)
- Possible hemoptysis (Hammer & McPhee, 2019, p. 281)
- Swollen, warm, tender lower extremity
- Possible atelectasis
- Cough
- Fatigue (Danielsbacka et al., 2021, para. 18)
- Wheezing (Hammer & McPhee, 2019, p. 281)
- High pulse (Hammer & McPhee, 2019, p. 281)

Computed Tomography Pulmonary Angiography

- Computed Tomography Pulmonary Angiography (CTPA) is commonly used to provide a quick diagnosis of a PE.
- CTPA is a helical scan of the chest through the thorax that includes thin-slice reconstruction images between 0.5-1.25mm (DeMaio, 2017, p. 46).
- The scan is typically a short and allows the patient to breathe during the scan to improve pulmonary ossification (DeMaio, 2017, p. 46).
- Scanning occurs in either a caudocranial or craniocaudal direction depending on departmental protocol, but preferably scanning caudocranial to prevent motion and streaking artifacts (DeMaio, 2017, p. 46).

- The scan is performed with 100ml of iodinated contrast media, at an injection rate of 4 to 5 ml/sec
- The recommended protocol used with a 64-slice CT scanner:
 - 100ml of nonionic contrast at a rate of 4ml/sec
 - 20 to 25 second scan delay
 - Helical scan with 0.625mm detector collimation
 - 80-120 kVp with 400 mA/0.8sec (DeMaio, 2017, p. 47)
 - 0.6mm reformatted images into coronal and sagittal multiplanar reconstructions (MPR), maximum intensity projections (MIP), and 3-D images (DeMaio, 2017, p. 47).
- Contraindications for a CTPA examination would include a known or previous allergic reaction to iodine, or pregnancy.

Radiographic Appearance

Arrows Identifying Multiple Pulmonary Emboli

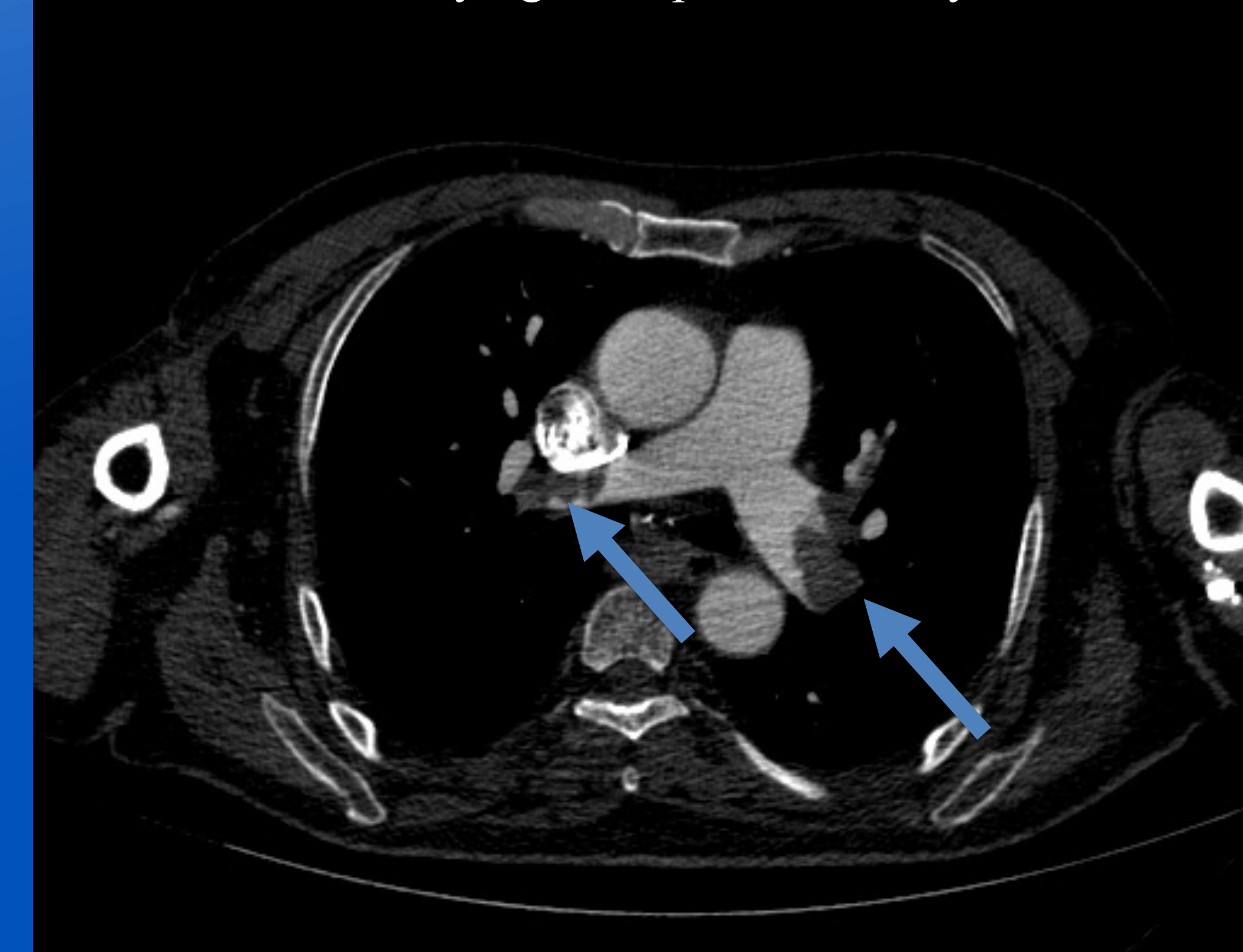
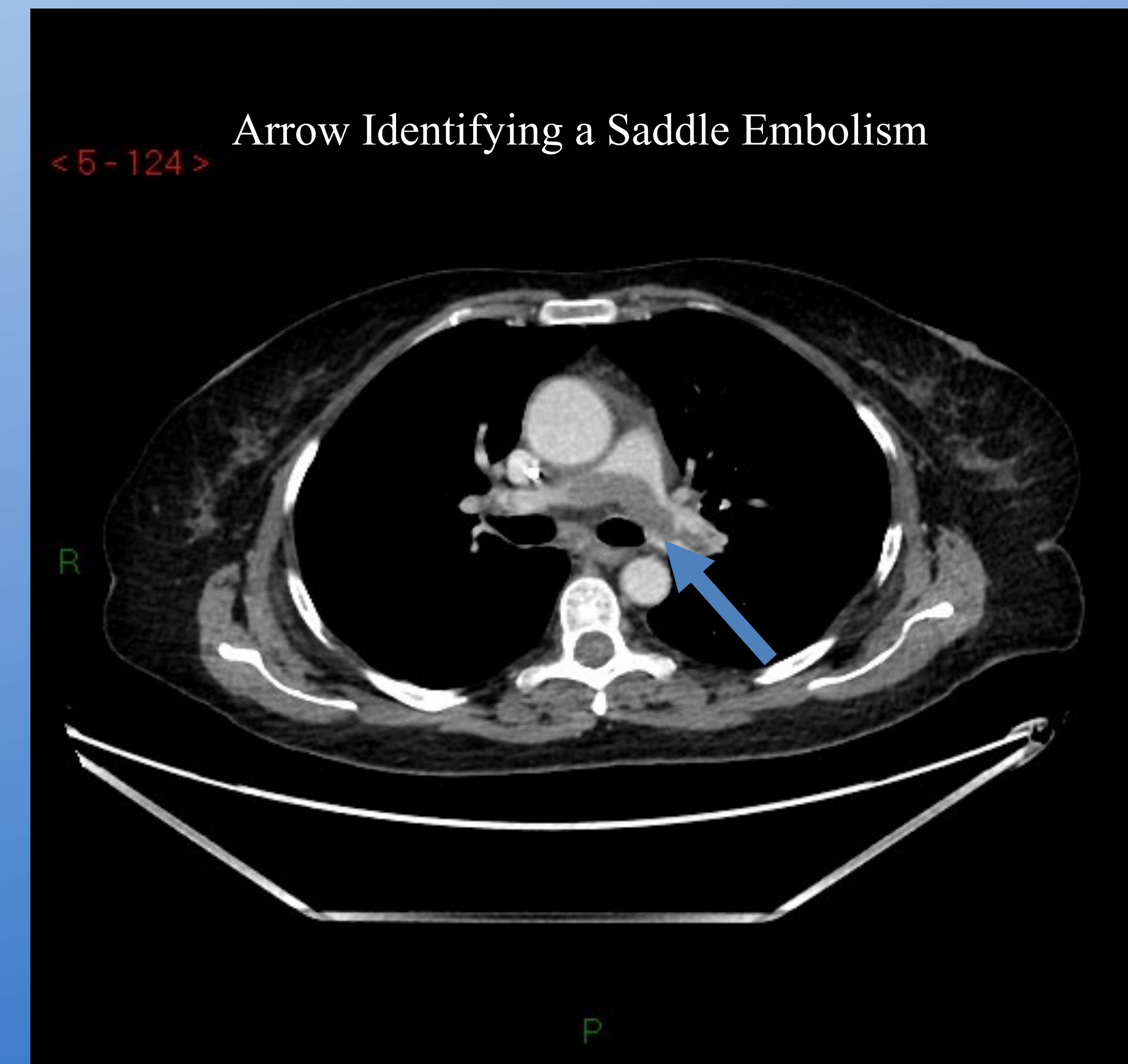


Image A: (Al Khateeb, 2016)

- Most of the pulmonary artery appears white. This white area on the image indicates most of the artery is filled with iodinated contrast.
- The grey (radiolucent) areas located distally on the right and left indicate pulmonary emboli of the right main and left main pulmonary arteries.



< 5 - 124 > Arrow Identifying a Saddle Embolism

Image B: (Almoghazi, 2017)

- There is a PE split in the right main and left main pulmonary arteries.
- This embolism is known as a saddle PE; a rare variation of a PE.

Treatment

- Treatment options depend on the severity of the emboli.
- The most common treatment option for PE is by using anticoagulation medication (Khandait et al., 2023, para. 5).
- Anticoagulation medication is used to prevent blood clots.
- Thrombolysis and catheter-based thrombus aspiration are also used for treatment for known emboli (Khandait et al., 2023, para. 5).
- In severe cases of PE, the emboli may need to be surgically removed through a process known as an embolectomy (Khandait et al., 2023, para. 23).

Conclusion

- A PE has the potential to become a serious fatal condition.
- Postmortem studies have shown that patients have suffered from untreated emboli.
- Symptoms of a PE should not be ignored. Seeking care should be done immediately to help manage the embolism.