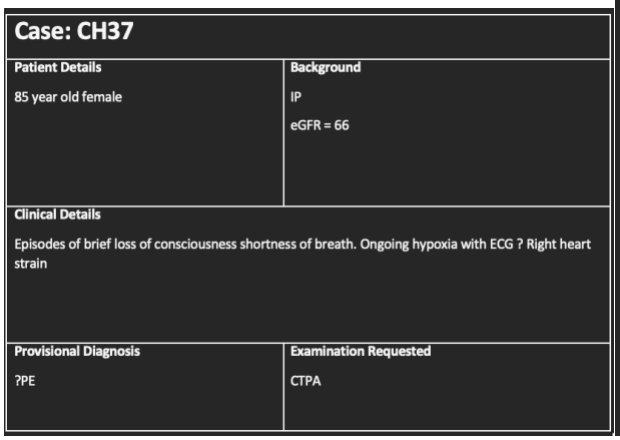
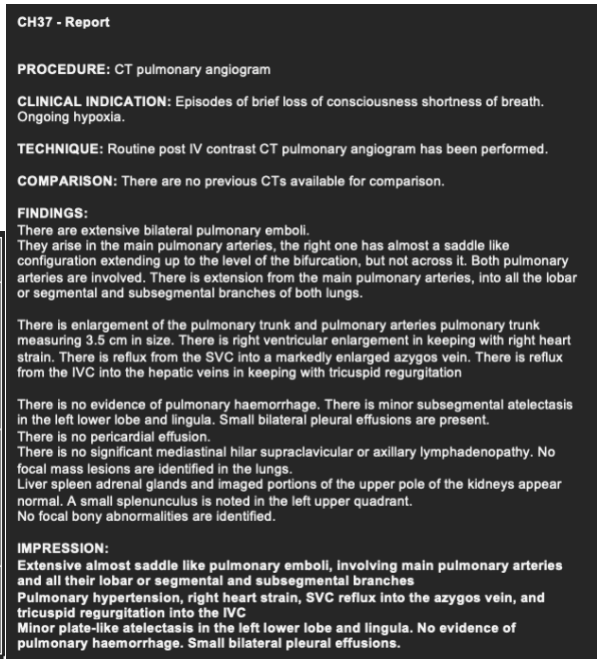


Case: CH37	
Patient Details 85 year old female	**Background** IP eGFR = 66
Clinical Details Episodes of brief loss of consciousness shortness of breath. Ongoing hypoxia with ECG ? Right heart strain	
Provisional Diagnosis ?PE	**Examination Requested** CTPA



CH37 - Report

PROCEDURE: CT pulmonary angiogram

CLINICAL INDICATION: Episodes of brief loss of consciousness shortness of breath. Ongoing hypoxia.

TECHNIQUE: Routine post IV contrast CT pulmonary angiogram has been performed.

COMPARISON: There are no previous CTs available for comparison.

FINDINGS:
There are extensive bilateral pulmonary emboli.
They arise in the main pulmonary arteries, the right one has almost a saddle like configuration extending up to the level of the bifurcation, but not across it. Both pulmonary arteries are involved. There is extension from the main pulmonary arteries, into all the lobar or segmental and subsegmental branches of both lungs.

There is enlargement of the pulmonary trunk and pulmonary arteries pulmonary trunk measuring 3.5 cm in size. There is right ventricular enlargement in keeping with right heart strain. There is reflux from the SVC into a markedly enlarged azygos vein. There is reflux from the IVC into the hepatic veins in keeping with tricuspid regurgitation

There is no evidence of pulmonary haemorrhage. There is minor subsegmental atelectasis in the left lower lobe and lingula. Small bilateral pleural effusions are present.
There is no pericardial effusion.
There is no significant mediastinal hilar supraclavicular or axillary lymphadenopathy. No focal mass lesions are identified in the lungs.
Liver spleen adrenal glands and imaged portions of the upper pole of the kidneys appear normal. A small splenunculus is noted in the left upper quadrant.
No focal bony abnormalities are identified.

IMPRESSION:
Extensive almost saddle like pulmonary emboli, involving main pulmonary arteries and all their lobar or segmental and subsegmental branches
Pulmonary hypertension, right heart strain, SVC reflux into the azygos vein, and tricuspid regurgitation into the IVC
Minor plate-like atelectasis in the left lower lobe and lingula. No evidence of pulmonary haemorrhage. Small bilateral pleural effusions.

Methods for the image acquisition based upon a thorough analysis of the radiological request form.

The patient has a lower than optimum eGFR, however, it is above the absolute threshold value of 30 and given the urgency of the situation this moderate contrast risk can be taken to ensure sufficient diagnostic quality. The 85-year-old patient is experiencing the inability to breathe, shortness of breath as well as the loss of consciousness. The referring doctor has requested a CTPA to rule out a pulmonary embolism. This scan facilitates the visualisation of blood vessels supplying the lungs, with a focus on the pulmonary arteries which carry deoxygenated blood from the right heart to the lungs to be oxygenated (Boyette and Burns, 2022). Along with the contrast, 50ml of saline is also injected to push the contrast through the vessels more effectively and enhance the contrast peak. We should aim to use bolus tracking to start monitoring the ROI (pulmonary trunk) at 7 seconds post-injection and start the scan at approximately 12 seconds post-injection. If the patient has a relatively small body habitus, 80-100 kVp would be sufficient. The patient should also avoid the Valsalva manoeuvre to avoid non-contrast blood in the pulmonary system and instead take a small breath in and hold.

Provide a written description of the typical CT appearances of the disease process under investigation.

After the CTPA images are obtained, radiologists analyse the images to look for signs of pulmonary embolism, such as filling defects (hypodense areas where blood flow is blocked) in the pulmonary arteries. The hyperdense white IV fluid allows for great contrast to visualise any emboli which will appear darker and can cause other consequences such as aneurysms, backflow of blood, perforation of blood vessel wall, abnormal heartbeat, and an increased blood pressure. When a large pulmonary embolism is positioned across the division of the pulmonary trunk, it may be termed a saddle embolus as described by the radiologist report. An acute pulmonary embolism often leads to pulmonary infarction, which is evident on CTPA as a wedge-shaped, peripheral opacity with a characteristic ‘reverse-halo’ appearance, comprising central ground glass and a rim of consolidation (Moore et al. 2018). Pleural effusions may sometimes accompany acute PE (Shah et al. 1999). In chronic pulmonary embolism intraluminal webs, calcification, thrombus recanalization, and filling defects adhering to the vessel wall are common (Moore et al. 2018). In chronic pulmonary embolism, the vessels typically appear smaller than usual, show abnormal tapering, and may exhibit complete blockage of the segmental vessel. Parenchymal alterations associated with chronic pulmonary

embolism include reduced perfusion and bronchial dilation. The pulmonary embolisms may increase the pressure in the pulmonary arteries and the right ventricle must overcome more pressure to pump the blood. This can result is backflow of the blood from the ventricle to the atrium and is termed tricuspid regurgitation.

Explain the importance of CT imaging in the disease process under investigation.

The results of the CTPA help guide further treatment decisions, such as anticoagulant therapy to prevent blood clots or interventions to remove existing clots. CT is still considered the gold standard when it comes to detecting pulmonary embolisms (Chen et l. 2017). According to Gruber and Bull (2008), around two-thirds of patients initially suspected of having PE are simultaneously diagnosed with other thoracic conditions at the same time as CT scans capture the whole thorax in high resolution allowing for the diagnosis of any pathology in that area. We get fantastic visualisation of the embolus. CTPA provides timely, high-resolution images, enabling rapid evaluation of even small pulmonary vessels and increasing the detection rate of segmental and subsegmental PEs (Gruber and Bull, 2008). These PEs can lead to blockage of blood flow to the lungs and fast treatment should be undertaken to avoid further embolization to avoid infarction of the lungs.

Review fine slice image data. Identify and describe any abnormalities.

Figure 1. highlights the minor pleural effusions on both sides of the posterior lung fields which appear as bumpy grey fillings, commonly seen in conjunction with pulmonary embolisms (Jany and Welte, 2019). The largest pulmonary embolisms can be seen in Figure 2. as a light grey saddle-like pulmonary embolism on the right appearing as a filling defect and extending towards the bifurcation. According to (Wong et al. 2021), a saddle like embolism is a rare occurrence of a thrombus located at the pulmonary bifurcation and can lead to sudden haemodynamic collapse. Another large pulmonary embolism can be seen in the left pulmonary artery in Figure 3. A study by Edwards et al. (1998) showed that normal patients studied had a pulmonary artery diameter of 2.72cm whereas patients with pulmonary arterial hypertension had a diameter of 3.47 cm. An enlarged pulmonary trunk measuring 3.5cm in diameter can be seen in Figure 4. The blue arrow in Figure 5. points to the abnormal SVC reflux which goes from the SVC back into the enlarged azygos vein.

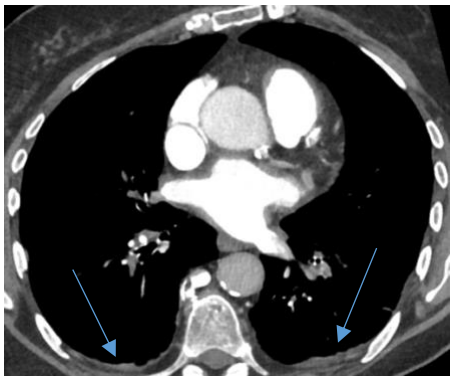


Figure 1. From 'Final Axial ST MPR' shows bilateral pleural effusions.

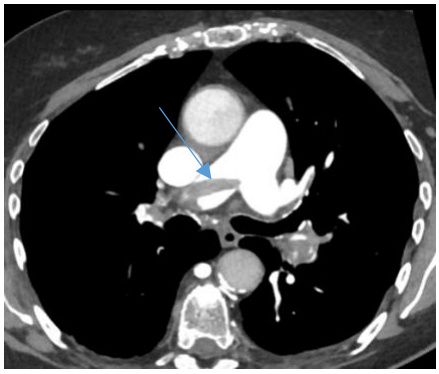


Figure 2. From 'Final Axial ST MPR' shows a pulmonary embolism on the right side.

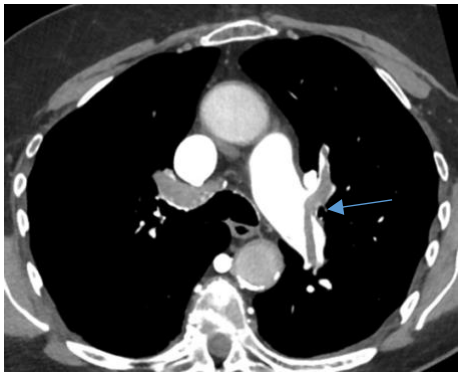


Figure 3. From 'Final Axial ST MPR' shows another pulmonary embolism on the left side.

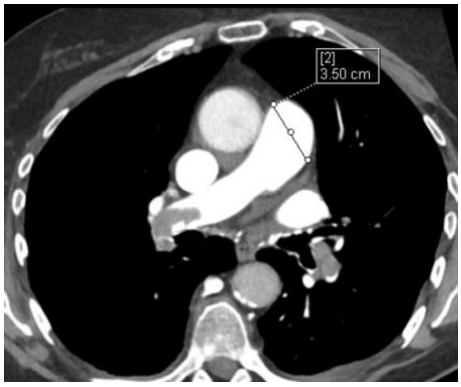


Figure 4. From 'Final Axial ST MPR' shows the enlarged pulmonary trunk.

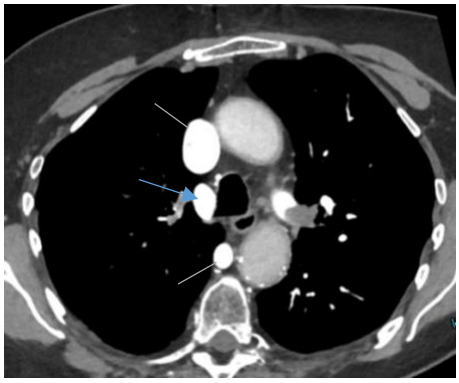
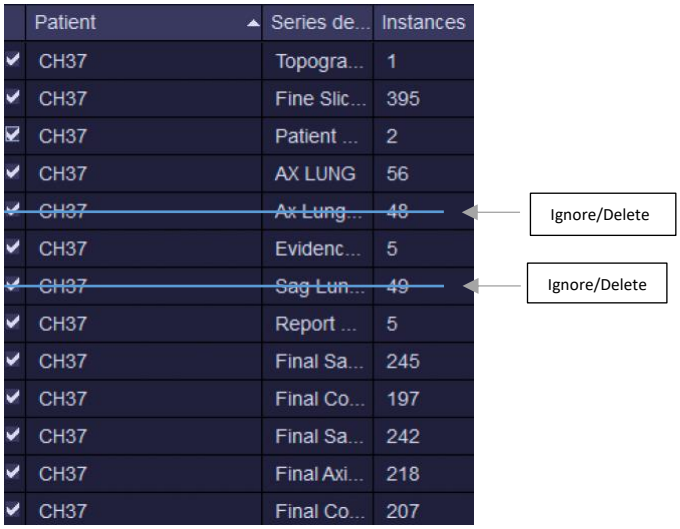


Figure 5. From 'Final Axial ST MPR' shows the SVC reflux.

On Syngovia:



Please only look at the MPRs labelled as 'Final'.

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