

A Study of Radiological Appearances of Septic Pulmonary Embolism in Contrast Enhanced Computed Tomography Thorax

Tapas Shah¹, Hari Priyanka², Purvi Desai³

ABSTRACT

Introduction:

Septic embolism, though dangerous and life threatening the number of cases reported are seldom. To diagnose septic embolism clinic-radiological correlation is must. Study aimed to depict various radiological appearances of septic thromboembolism according to there frequency of occurrence and using clinical history to strengthen the suspicion of SPE in patients as SPE have grave prognosis if not detected early.

Material and methods: Study was done in the Government Medical College Surat including the subjects of clinically suspected septic pulmonary thromboembolism and studying the radiological pattern of their presentation during the year 2018-2019.

Results: In this study the most common radiological presentation is feeding vessel sign seen in (90%) of patients CT, the most common cause is liver abscess constituting (40%) of cases, the most common primary cause in the patients with complications and mortality is pneumonia and most common sequelae is acute respiratory failure constituting (66%) of mortality and most common chronic ailment association is diabetes mellitus seen in (60%) of patients.

Conclusion: Septic pulmonary embolism is life threatening but diagnosis is difficult as there are no specific clinical complaints and radiological features but for benefit of patient quick diagnosis and management must be started as it has high mortality rate. SPE should be considered in the differential diagnosis of patients presenting extrapulmonary infective focus, respiratory symptoms, and parenchymal pulmonary nodules on imaging studies of the chest

Keywords: Feeding Vessel, Infective Foci, Acute Breathlessness, Wedge Infarct, MODS.

INTRODUCTION

Septic embolism is defined as micro-organism containing thrombus causing mechanical blockage of arteries and inflammatory reactions within them.^{1,2}

The patients may present with insidious respiratory illness with fever and breathlessness which may also deteriorate leading to acute respiratory failure, septic shock, multiorgan dysfunction syndrome and systemic inflammatory response syndrome.³ Symptoms cover the entire spectrum from asymptomatic patients to sudden death.¹

The source of infection is of wide range and most common source of septic embolism in lung is being infective foci in right heart (eg. Tricuspid vegetation in infective endocarditis), the next being infective foci in liver (eg. Liver abscess), pneumonia, deep neck space infection, renal abscess, large abscess in subcutaneous plane in close relation

to blood vessels (neck, axilla) etc.⁴ Some studies proved that pneumonia is most common cause of septic pulmonary thromboembolism like Morikawa et al. reported CT findings, including GGA, centrilobular nodules, consolidations, reticular opacities, nodules, and pleural effusion, from 68 patients with methicillin-resistant *S. aureus* (MRSA) and 83 patients with methicillin-susceptible *S. aureus* (MSSA) pneumonia.⁵

Radiological appearances of septic embolism has broad spectrum comprising feeding vessel sign, wedge shaped opacities, pleural effusions, nodules without cavities, nodules with cavities, ground glass opacities, focal consolidations and lung abscess. Study aimed to depict various radiological appearances of septic thromboembolism according to there frequency of occurrence and using clinical history to strengthen the suspicion of SPE in patients as SPE have grave prognosis if not detected early.

MATERIAL AND METHODS

This study was conducted in Surat government medical college Gujarat India. We performed a prospective study during a period of one year where we studied the appearance of types of lesions in septic embolism patients which were referred from the other departments of Government medical college Surat in whom septic embolism was suspected and the presence of a primary source of infection a potential embolic source was known and follow up was done to check the improvement after antibiotic therapy. Patients with tuberculosis and lung malignancy were excluded from the study as tuberculosis have wide range of presentations and embolism in known case of lung malignancy is mostly tumoral thrombosis. Known case of lung malignancy embolus is mostly from tumoral thrombosis

Data collection: The following details of the patients are collected Age, sex, primary infective foci, length of intensive

¹Third Year Resident, ²First Year Resident, Department of Radio-Diagnosis and Imaging Government Medical College, Surat, ³Head of Department, Department of Radio-Diagnosis and Imaging, Government Medical College, Surat, Gujarat, India

Corresponding author: Dr. Tapas Shah, Department of Radiodiagnosis, No-9, New Civil Hospital, Near Majura Gate, Surat, Gujarat Pincode:395001, India

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care unit stay, SOFA score and final outcome.

CT details: Aquilion 16 slice CT with 120 kV, 100–320 mA, 1.0-second rotation time, and 5-mm collimation and HRCT is done in 1mm collimation at a lung-window setting level of -400 Hounsfield units (HU) with a width of 1600 HU.

Clinical assesment: In this study we assessed the clinical status of patients qSOFA score, which is also known as quickSOFA which is a bedside prompt that may identify patients with septic pulmonary embolism infection who are at greater risk for a poor outcome outside the intensive care unit. It uses three criteria, assigning one point for low blood pressure (SBP≤100 mmHg), high respiratory rate (≥22 breaths per min), or altered mentation (Glasgow coma scale<15)

RESULTS

In 10 patients studied within a period of 2 years November 2017 to October 2019 the following interpretations are done: 6 (60%)patients directly came from emergency out patient department and 4 (40%) of them came from intensive care unit who are already in deteriorated stage on the day of admission . The diagnosis of septic pulmonary embolism was made on the day of admission in 5 people (50%) and was made after 5 days of admission in 5 (50%) patients. 3 (30%) patients died during treatment period and 7 (70%) recovered on treatment.



Image-1: Feeding vessels

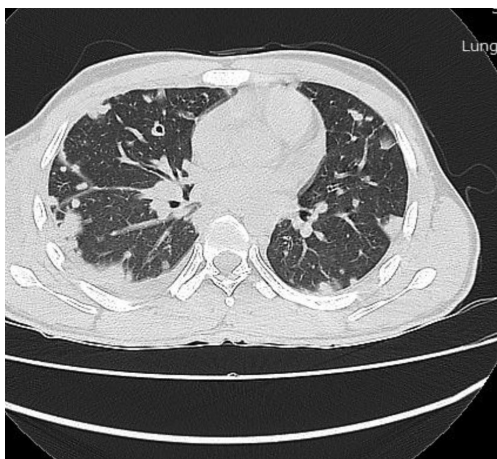


Image-2: Nodules cavitary and noncavitary

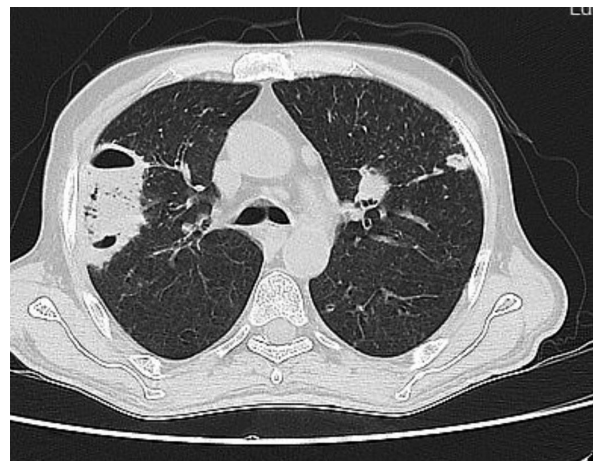


Image-4: Lung abscess formation

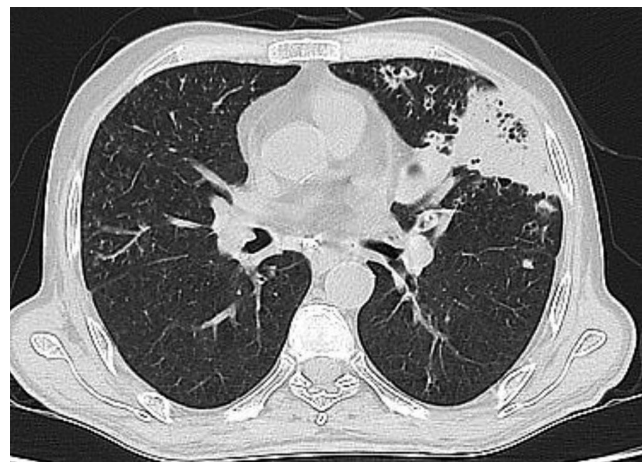


Image-5: Consolidation with airbronchogram



Image-3: Wedge shaped opacity

Chronic ailments association was also studied where 6 (60%) patients are diabetic and 5 (50%) patients are hypertensives. On contrast enhanced CT 9 (90%) patients showed the classical feeding artery sign (image1), 8 patients showed bilateral involvement (80%), 7 (70%)patients shows nodular cavitary and noncavitary lesion (Image2), 2 (20%) showed pleural effusion and 3 patients showed wedge opacities (image 3) and rarely they may lead to lung abscess (image4) 6 (60%) patients showed patchy ground glass opacity (GGO) and consolidation (image5).

Pt no.	Infective focus	Diabetes	Hypertension	Laterality	Nodules	GGO	Feeding vessels	Pleural effusion
1	Liver abscess	+	-	BI	+	+	+	-
2	Abscess in axilla	-	+	BI	-	+	+	-
3	Liver abscess	+	+	BI	+	-	+	+
4	Pneumonia	+	-	UNI	+	+	+	-
5	Liver abscess	-	-	BI	+	-	+	-
6	Pneumonia	-	-	BI	-	+	+	+
7	Gluteal abscess	+	+	BI	+	+	+	-
8	Liver abscess	+	+	UNI	+	+	+	-
9	Pneumonia	-	+	BI	-	-	-	-
10	Abscess in neck spaces	+	-	BI	+	-	+	-

Table-1: Case details

On follow up of 7 patients responding for treatment they became stable within 7 days of antibiotic treatment and clinical and radiological betterment is found.

Most common complications causing death in septic pulmonary embolism patients include acute respiratory failure (most common in our study cause of death in 2 patients contributing (20%) overall and 66%, septic shock, Disseminated intravascular coagulation, acute kidney injury and multiorgan dysfunction syndrome.

In our study most common cause of septic pulmonary embolism is liver abscess (4-40%) (most of them occurring in right lobe of liver) second cause being pneumonia (3-40%) mostly involving lower lobes and third cause being subcutaneous abscess (3-30%) which is mostly involving gluteal region and axilla (table-1).

Hence patients with liver abscess, pneumonia, or tricuspid valve infective endocarditis require critical care, physicians should carefully examine the possibility of septic pulmonary embolism and order for aggressive investigations. Third, early diagnosis, appropriate antibiotic therapy, surgical intervention and respiratory support are essential for the treatment of patients with septic pulmonary embolism.

DISCUSSION

The diagnosis of septic thromboembolism is mostly because of some other primary infective foci which can be depicted sometimes and cannot be diagnosed in significantly greater chunk of patients. According to the study of Micheal Y Lin et al The pathogenesis of septic pulmonary emboli in their patients remains speculative. As demonstrated in prior pediatric studies deep tissue infections may be associated with local venous, and presumably septic, thrombophlebitis with septic pulmonary emboli. It is therefore plausible that our patients' deep tissue infections were complicated by local septic thrombophlebitis that could not be detected using the imaging modalities available, clinically occult focus of septic thrombophlebitis cannot be definitively excluded except for tricuspid valve infective endocarditis which can be visualized and diagnosed using a trans-esophageal echocardiography.

The clinical symptoms include fever in 8 patients (80%), breathlessness in all 10 patients (100%), chest pain in 6 patients (60%) mainly acute in onset, cough, hemoptysis. According to Ye R. et al⁴ in all 168 SPE cases, the symptoms

were not specific, most manifested as bacteremia, dyspnea, chest pain, cough and other respiratory symptoms as well as symptoms of the extra pulmonary primary infective focus. There was fever in 144 cases (85.71%) (the highest temperature, described in 48 of these 144 cases, was 37.5–40.6 °C (mean 38.37 ± 0.92 °C)), dyspnea in 81 cases (48.21%), chest pain in 82 cases (48.81%), cough in 69 cases (41.07%), fatigue in 44 cases (26.19%), anemia in 31 cases (18.45%), hemoptysis in 24 cases (14.29%), disease progression to respiratory failure in 26 cases (15.48%), septic shock in 18 cases (10.71%).

In this study the various radiological appearances include 9 (90%) patients showed the classical feeding artery sign, 8 patients showed bilateral involvement (80%), 7 (70%) patients shows nodular cavitary and noncavitary lesion, 6 (60%) patients show patchy ground glass opacity (GGO), 2 (20%) shows pleural effusion.

Which in comparison with the study done by RMHuang.⁷ These included peripheral nodules with clearly identifiable feeding vessels associated with metastatic lung abscesses (10 [67%] of 15 cases), and subpleural, wedge-shaped densities with and without necrosis caused by septic infarcts (11 [73%] of 15 cases).

In 10 patients studied under this study MODS is the most common sequelae and acute respiratory failure⁹ is the most common systemic failure noted in 6 (60%) patients. The most common underlying condition in our study is liver abscess followed by pneumonia and then subcutaneous abscesses. The most common underlying cause of death in patients with septic pulmonary embolism is pneumonia which is the second most common cause of septic pulmonary embolism in our study which agrees with the study done by Deng Y Chow et al³ where pneumonia was the most common cause of death, followed by liver abscess.

The qSOFA scoring of the subjects include a score of 2 for 5 (50%) 3 for 3 (30%) and 1 for 2 (20%) which is agreeing with Ferreira et al⁸ where a total of 184 patients were included; 84.24% had a SOFA score of 2 or higher. The relative risk of death, need for intensive care unit (ICU) and mechanical ventilation (MV) related to a positive SOFA on admission were: 5.17 (2.11–12.87), 1.45 (1.09–2.15) and 2.74 (1.63–5.16). In SPE the qSOFA is most commonly higher than 2.

CONCLUSION

Septic pulmonary embolism is life threatening but diagnosis is difficult as there are no specific clinical complaints and radiological features but for benefit of patient quick diagnosis and management must be started as it has high mortality rate. SPE should be considered in the differential diagnosis of patients presenting extrapulmonary infective focus, respiratory symptoms, and parenchymal pulmonary nodules on imaging studies of the chest. This study concludes that all septic pulmonary embolism patients require critical care especially with conditions with high rates of mortality like pneumonia and liver abscess leading to septic pulmonary embolism. Imaging is indicated in all septic pulmonary embolism patients as the recovery of the patients depends upon early diagnosis and appropriate antibiotics with respiratory support.

There is only limitation in this study is including only a single institution within a period of time.

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