Case Report

Radiation primed BOOP: A Case report and Review of literature

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Case summary:

A 59 year old non-smoker male presented with 2 weeks history of dyspnea, cough with mucopurulent expectoration and associated chest pain for the last 3 days. He was asymptomatic and leading a normal life until 2 years ago, when he was detected to have carcinoma tongue for which he had undergone local resection. Four months ago he had nodal recurrence in neck for which he underwent modified radical neck dissection followed by radiotherapy in another hospital, the details of which were not available. He remained asymptomatic until the present admission. Laboratory and ECG findings were unremarkable at the time of admission.

Chest X-Ray showed perihilar interstitial shadowing and mild volume loss on left side with bilateral small pleural effusions (fig:1).Computerized tomography thorax with HRCT(fig:2-a,b,c,d) was done which showed multiple patchy areas of ground glass opacities with inter lobular septal thickening suggestive of crazy paving pattern. Left lung parenchyma showed predominantly consolidation changes. Bilateral small pleural effusions were also noted. The lung parenchymal changes were predominantly in the peribronchial location. Radiological features were consistent with Bronchiolitis Obliterans Organizing Pneumonia (BOOP).

He was started on antibiotics, corticosteroids and other supportive care. A day after admission, his condition deteriorated with altered sensorium, carbon dioxide narcosis and features of cardiac failure. Cardiology consultation lead to a diagnosis of NSTEMI. Due to persistent and worsening CO2 retention he was intubated and ventilated. He had associated acute pre renal failure and hypotension which was managed with multiple inotropic support. In spite of aggressive antibiotic therapy, inotropic support and mechanical ventilation his general condition continued to deteriorate. 15 days after admission to our hospital, he developed cardiorespiratory arrest and succumbed to the illness.

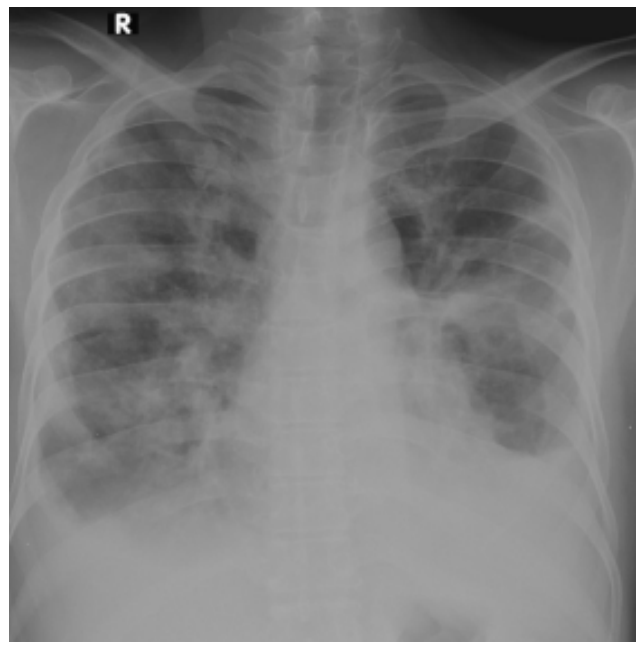

Fig 1: Chest radiograph PA view, showing perihilar reticular and patchy acinar shadows, mild volume loss on left side and bilateral mild pleural effusion.

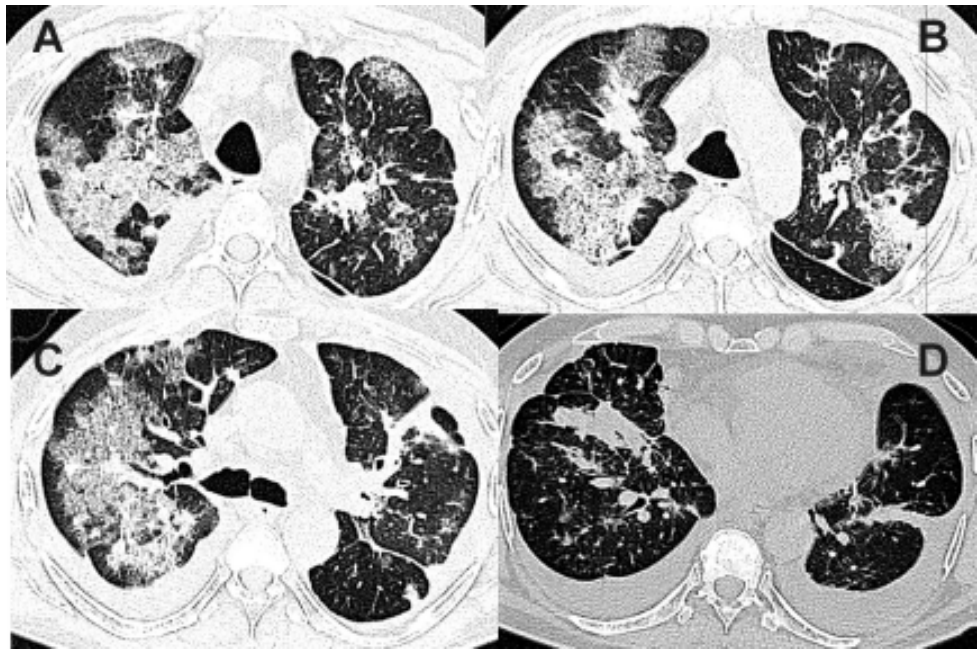

Fig:2: (a,b,c,d) showing multiple patchy areas of ground glass opacities with inter lobular septal thickening suggestive of crazy paving pattern ; Left lung parenchyma shows predominantly consolidation; bilateral mild pleural effusions.

Discussion:

Radiation pneumonitis and chronic radiation fibrosis are well recognized complications of thoracic radiotherapy, rarer parenchymal complications being Radiation primed - Bronchiolitis Obliterans Organizing Pneumonia (BOOP) and eosinophilic pneumonia[1]. In a patient who has undergone radiotherapy, the clinical features and radiological pattern will help clinicians to differentiate the pattern of radiation induced lung disease (RILD) from Radiation primed BOOP, and initiate appropriate treatment and follow up.

Radiation induced lung disease (RILD)

Early transient pneumonitic phase of RILD occur about 4 to 12 weeks after completion of radiotherapy [2]. It manifests as ground glass opacities or consolidation in the field of irradiation. The initial features of pneumonitis can disappear if the lung injury is limited. Chronic radiation fibrosis occurs between 6 to 12 months after radiation [3], there after attaining stability. Radiation fibrosis manifests with linear scarring, volume loss, consolidation and traction bronchiectasis [4,5]. With progression of radiation-fibrosis the demarcation between normal and irradiated lung parenchyma becomes more evident.

Histologically, early pneumonitis is characterized by acute exudative phase and further continued damage to lung fields results in organizing phase with interstitial infiltration due to mononuclear and inflammatory cells [6-9], subsequently leading to chronic or fibrotic phase [6].

'Radiation primed BOOP'

Bronchiolitis Obliterans Organizing Pneumonia (BOOP) is a distinct clinical, imaging and pathological entity characterized by intraluminal plugs of granulation tissue within alveolar ducts and surrounding alveoli with variable degree of interstitial and air space infiltration by foamy macrophages and mononuclear cells.

Clinically half of these patients present with influenza-like illness followed by a few months duration of persistent nonproductive cough, effort dyspnea, low-grade pyrexia, malaise and weight loss. Less common symptoms include pleuritic chest pain and hemoptysis.

Radiological manifestation of BOOP includes patchy bilateral air space consolidation, ground glassing with interstitial thickening giving a crazy paving pattern or perilobular opacities. The distribution is along subpleural and peribrochial distribution. Other findings seen include bronchial wall thickening and dilatation in abnormal areas,

small or large nodular opacities, reversed halo sign or atoll sign, pleural effusion, mediastinal lymphadenopathy etc.

Arbetter KR et al [10], in their study concluded that irradiation damages lung tissue even outside the direct treatment field and suggested that an immunologically mediated lymphocytic alveolitis may be responsible for the recurrent migratory organizing pneumonitis. Bruno Crestani et al [11] in their study of tangential irradiation given to patients with carcinoma breast hypothesized that unilateral lung irradiation may 'prime' the lung to further damage ,resulting in subsequent development of a characteristic radiologic and histological appearance of BOOP. Radiation primed BOOP is a rare yet distinct entity with very few literature study done in the past [19]. The incidence of radiation primed BOOP reported in cases of carcinoma breast ranges between 1.8 to 2.5% [12,13].

The exact mechanism of disease progression is unknown. However the current understanding is that an immunological mechanism is thought to be the etiological factor governing disease. Tissue damage as a result of irradiation results in sensitization of auto reactive lymphocytes, which react with pulmonary tissues resulting in histological and radiological appearance of Cryptogenic Organising Pneumonia (idiopathic BOOP)[14]. It is also possible that mast-cells could play a role [15]. Some studies suggest the possibility of radiotherapy induced gene activation and transcription, cytokine release and fibroblast activation resulting in priming of lung fields [16].

In radiation-primed BOOP treatment with systemic steroids is effective eventhough relapses are described after withdrawal [17]. A rare rapidly progressive form of BOOP is characterized by quick progression of the disease resulting in acute respiratory failure [18]. But this type is not reported in radiation primed BOOP so far.

Conclusion:

Radiation induced interstitial lung disease is mostly confined to the field of irradiation. However, Radiation primed BOOP although rare, has to be considered when there is a positive history of irradiation near or within the lung fields in persons with normal lungs and there are clinical manifestations and radiological evidence of migratory alveolitis involving bilateral lung fields later on. We postulate that radiation to neck was responsible for priming the lungs to BOOP in our case . Treatment with long term steroids is effective in preventing the progression of radiation primed BOOP with a good prognosis.

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Self assessment Quiz Answer

1. CT shows circumferential thickening of esophageal wall with mucosal irregularity. This with history of dysphagia is highly suggestive of esophageal carcinoma
2. In a suspected upper GI malignancy diagnostic investigation is upper GI endoscopy which will help to visualize the lesion and take tissue sample from the abnormal area for histopathological examination to clinch the diagnosis.
3. Most common pulmonary complication of esophageal carcinoma is aspiration pneumonia.

- Other pulmonary manifestations of esophageal carcinoma are metastasis to the lungs, malignant pleural effusion, involvement of trachea leading to fistula formation, intra-thoracic adenopathy, Pulmonary lymphangitis carcinomatosis and hoarseness of voice due to recurrent laryngeal nerve involvement.
- Some patients with carcinoma esophagus develop clubbing and hypertrophic pulmonary osteo arthropathy

4. Most common cause for acquired Tracheo esophageal fistula (TEF) is carcinoma of esophagus. All the other conditions can also lead to TEF.

- Tracheal involvement by cancer can occur in up to 25% of patients with advanced esophageal cancer.
- Tracheal involvement is more common with cancers of the mid- and upper part of esophagus as this part is close to trachea.
- Tracheal involvement in esophageal cancer can be detected by CT scan of thorax
- Palliation in these patients is with 'double' stents, one in the esophagus and one in the trachea.

Radiology Quiz Answer

Tuberous Sclerosis with Lymphangioleiomyomatosis and renal angiomyolipoma.

Discussion

Lymphangioleiomyomatosis (LAM) is an idiopathic interstitial lung disease predominantly affecting women of the child bearing age.[1] Pathologically, LAM is characterised by peribronchial, perivascular, and perilymphatic proliferation of smooth muscle-like cells, resulting in vascular and airway obstruction with cyst formation. Chest roentgenograph shows hyperinflation or preserved lung volumes (in sharp contrast to most other ILDs), reticulonodular shadows and discrete small cysts. HRCT allows better delineation of the cysts, which, in a classical case, are evenly distributed throughout the lungs. The cysts are small and thin walled. Pneumothorax and chylothorax are known to occur. Diagnosis may be confidently made in a case with classical clinical and radiological features, but atypical presentations need lung biopsy.

Tuberous sclerosis (TSC) is an autosomal dominant neurocutaneous disorder belonging to a group of hamartomatous diseases known as the phakomatoses. TSC is characterized by hamartomas of the skin, eye, heart, kidney, and brain. Seizures during childhood and mental retardation occur routinely. The quoted incidence of LAM in ladies with TSC has been variable in medical literature. Although early literature seemed to indicate a lower incidence of 2-3% only,[2] with modern radiologic techniques rates as high as 30-40% have been reported. [3] Renal angiomyolipomas are known to occur in upto 70% of subjects with TSC, [4] the imaging features again being classical. Nervous system lesions including meningiomas and classic skin lesions (shagreen patches, ash leaf macules, adenoma sebaceum etc) occur in TSC.

Summarising, the present subject had tuberous sclerosis complex with pulmonary lymphangio-leiomyomatosis and renal angiomyolipoma with acute intraabdominal bleed.

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