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Resolution of Respiratory Failure with Radiotherapy in Myelofibrosis

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Splenomegaly can be an independent cause of morbidity in patients with idiopathic myelofibrosis (IMF). Massive splenomegaly can lead to early satiety, bloating, splenic pain, portal hypertension and cytopenias [1]. Radiotherapy (RT) had been used either for symptomatic relief and extramedullary hematopoiesis in patients with IMF [1, 2]. While RT is generally effective in these indications, the effects may be transient and patients may experience significant myelosuppression which potentially causes significant morbidity [1, 2]. Respiratory failure in patients with IMF may be due to interstitial or pleural extramedullary hematopoiesis or severe infections. To our knowledge, there is no report of splenomegaly-induced hypoxemic hypercapnic respiratory failure resolving with splenic RT.

A 61-year-old male patient presented with shortness of breath and severe peripheral edema. He had a diagnosis of IMF 6 years ago and was on hydroxyurea treatment for 4 years. During the last 3 months he had had these symptoms progressively and he received frequent (approximately once a week) blood transfusions for severe anemia. Physical examination revealed paleness, bilateral pretibial severe pitting edema, jugular venous distention, tachypnea, dullness to percussion in the right hemithorax, bilateral basilar coarse crackles, hepatomegaly (10 cm below the right costal margin) and massive splenomegaly which reached the pelvis and right lumbar region. Laboratory analysis revealed normal renal functions, electrolytes and liver enzymes. Lactate dehydrogenase (2,838 U/l, normal value <450) and uric acid (10 mg/dl) levels were elevated. The erythrocyte sedimentation rate was 32 mm/h and the C-reactive protein level was 10 mg/l. Complete blood count showed normocytic anemia (hemoglobin 6.8 g/dl), leukocytosis (white blood cells 28,800/mm³, neutrophils 13,000/mm³) and a normal platelet value (176,000/mm³). Arterial blood gas analysis showed hypoxemia (pO₂ 54 mm Hg, SO₂ 83%), hypercapnia (pCO₂ 51 mm Hg), a pH of 7.40 and a bicarbonate level of 30 mEq/l. On admission, the patient was given intravenous diuretic therapy which resulted in polyuria and resolution of pe-

ripheral edema. Two liters of nasal oxygen resulted in normalization of oxygen saturation (96%) but headache and somnolence developed. Control arterial blood gas analysis showed a pCO₂ level of 75 mm Hg. Oxygen treatment was stopped. Bi-level positive airway pressure treatment was begun. Pleural effusion was transudative and had a low cell count; smear from centrifuged pleural fluid showed scarce erythroblasts. Six hundred milliliters of pleural fluid was drained. Echocardiography revealed severe pulmonary arterial hypertension (104 mm Hg), normal left ventricle systolic functions, left ventricle hypertrophy, degenerative mild aortic stenosis and moderate mitral valve insufficiency. Ultrasound of the abdomen confirmed hepatomegaly and splenomegaly and revealed ascites. Ascitic fluid analysis showed that ascites were of a portal hypertensive type and contained precursors of myeloid and erythroid cell lines. Despite adjustment of inspiratory and expiratory pressures of bi-level positive airway pressure device and delivered oxygen concentration, severe hypercapnia persisted (above 65 mm Hg). Control arterial blood gas analyses in ambient air showed that hypoxemia persisted in the following days. There was no significant congestion, rales, pleural effusion or ascites along with respiratory failure. At this time, restriction of diaphragmatic movement by massive splenomegaly was considered an important cause of respiratory failure. Splenic RT was begun and resulted in significant regression of splenic volume. One week after the beginning of RT, respiratory distress resolved and control blood gas analysis in ambient air showed normalization of pO₂ (76 mm Hg) and near normalization of pCO₂ (51 mm Hg). The leukocyte and pCO₂ levels before and during RT are listed in table 1. This was consistent with the resolution of respiratory failure but with persistence of alveolar hypoventilation. After 7 cycles of RT, severe pancytopenia developed. With supportive measures and filgrastim therapy, cytopenias resolved without a serious complication. However, the severity of cytopenias increased after RT and the patient needed more frequent red blood cell and platelet transfusions.

Table 1. Levels of leukocyte and carbon dioxide pressures before, during and after RT

Days of RT	-3	-1	0	1	3	5	7 (last day of RT)	+1
WBC	9,600	9,880	8,850	7,180	4,450	3,200	1,210	700
pCO ₂	68	69	65	67	67	66		51

WBC = White blood cell count.

Although this patient had several etiologic factors for respiratory failure including congestive heart failure, pleural effusion and ascites, hypoxemia and hypercapnia persisted even more than 1 week after these factors resolved. Recently, pulmonary arterial hypertension associated with chronic recurrent thromboembolism or myeloid metaplasia was reported in patients with myeloproliferative diseases [3]. These factors might have been important in our patient as well, because he had severe pulmonary arterial hypertension on echocardiography. However, although we did not administer thrombolytics or pulmonary vasodilators, our patient's respiratory distress resolved with RT. This made us consider massive splenomegaly as the main etiologic factor. Remission of respiratory failure in relation with regression of massive splenomegaly supported our consideration. We suggest that diaphragmatic restriction due to massive splenomegaly should be considered an etiologic factor for respiratory failure and that this is considered an indication for RT.

References

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