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REVIEW

# Pulmonary manifestations of inflammatory bowel disease

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## Abstract

Extraintestinal manifestations of inflammatory bowel disease (IBD) are a systemic illness that may affect up to half of all patients. Among the extraintestinal manifestations of IBD, those involving the lungs are relatively rare and often overlooked. However, there is a wide array of such manifestations, spanning from airway disease to lung parenchymal disease, thromboembolic disease, pleural disease, enteric-pulmonary fistulas, pulmonary function test abnormalities, and adverse drug reactions. The spectrum of IBD manifestations in the chest is broad, and the manifestations may mimic other diseases. Although infrequent, physicians dealing with IBD must be aware of these conditions, which are sometimes life-threatening, to avoid further health impairment of the patients and to alleviate their symptoms by prompt recognition and treatment. Knowledge of these manifestations in conjunction with pertinent clinical data is essential for establishing the correct diagnosis and treatment. The treatment of IBD-related respiratory disorders depends on the specific pattern of involvement, and in most patients, steroids are required in the initial management. Corticosteroids, both systemic and aerosolized, are the mainstay therapeutic approach, while antibiotics must also be administered in the case of infectious and suppurative processes, whose sequelae sometimes require surgical intervention.

**Key words:** Inflammatory bowel diseases; Crohn's disease; Ulcerative colitis; Lung diseases



**Core tip:** The clinicopathological patterns of pulmonary involvement in inflammatory bowel disease (IBD) consist of airway disease, lung parenchymal disease, thromboembolic disease, pleural diseases, enteric-pulmonary fistulas, and pulmonary function test abnormalities. The treatment of IBD-related respiratory disorders depends on the specific pattern of involvement, and in most patients, steroids are required in the initial management. This review focuses on the pulmonary manifestations of IBD in an attempt to avoid further health impairment and to alleviate symptoms by prompt recognition and treatment.

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## INTRODUCTION

Inflammatory bowel diseases (IBDs) are chronic inflammatory diseases of unknown etiology that commonly involve the gastrointestinal tract[1]. Crohn's disease (CD) and ulcerative colitis (UC) are the two main forms of chronic IBD. Extraintestinal and systemic manifestations occur commonly in patients with IBD (21%-41%)[2-4], increase with duration of intestinal disease, and affect most organ systems[5]. The extraintestinal manifestations are a significant cause of morbidity and may be particularly distressing for the patient[6]. Extraintestinal manifestations are more common in CD and may include cutane-

ous (pyoderma gangrenosum and erythema nodosum), ocular (anterior uveitis and episcleritis), hepatic (pericholangitis and fatty liver), and articular (peripheral and axial arthropathies) diseases[7]. Mouth ulcers and venous thrombosis also occur[8]. In contrast, pulmonary involvement is rare[9,10].

A possible link between UC and respiratory disease was described first by Turner-Warwick[11] in 1968, but it was not until the work of Kraft *et al*[12] in 1976 that respiratory involvement came to be included in the list of established complications of IBD. The authors described six adult patients with IBD who developed chronic bronchial suppuration with or without bronchiectasis. Following this report, many investigators described a similar pattern, and other manifestations of pulmonary involvement were described, including: interstitial pneumonitis, panbronchiolitis, bronchiolitis obliterans organizing pneumonia (BOOP), inflammatory tracheal stenosis, serositis, pulmonary vasculitis, apical fibrosis, Langerhan's cell histiocytosis, sarcoidosis, and conditions resembling Wegener's granulomatosis[13-23]. Respiratory diseases occurring in IBD may consist merely of a subclinical abnormal lung function or, in contrast, they may manifest as clear interstitial lung disease[15].

Pulmonary alterations are often overlooked, especially when respiratory symptoms are already present before the diagnosis of IBD. The true prevalence of lung involvement in IBD remains unknown and it seems rather variable, because in some series only a few cases of respiratory complications have been found[24]. However, it can be difficult to establish a relationship between respiratory diseases and IBD in patients who are already affected with pulmonary disease at diagnosis of IBD, or who are current smokers.

An ongoing bowel inflammation is not a prerequisite for the onset of respiratory alterations, because bronchopulmonary diseases that develop after colectomy have been reported[25]. Pulmonary abnormalities in IBD can present years after the onset of the bowel disease and can affect any part of the lungs. These may be overt or subclinical and do not correlate with the duration of IBD. The pulmonary manifestations are variously reported as occurring frequently during active disease, independent of disease activity, and even in post-colectomy patients[26,27].

The pathogenesis of IBD causing lung abnormalities involves some of the following mechanisms: both the colonic and respiratory epithelia share an embryonic origin from the primitive foregut and have columnar epithelia with goblet cells and submucosal mucus glands; the lungs and gastrointestinal tract contain submucosal lymphoid tissue and play crucial roles in host mucosal defense[28,29]. The similarity in the mucosal immune system causes the same pathogenic changes that may result from epithelial exposure to common antigens by inhalation and ingestion, leading to sensitization of the lymphoid tissue and inflammation[13]. The activated inflammatory cells in the bowel tissues are capable of producing several circulating cytokines such as interleukin (IL)-1, IL-2 and IL-6 and tumor necrosis factor (TNF)-α. These and other mediators can regulate the endothelial cell adhesion molecules, alter leukocyte migration, increase production of damaging reactive oxygen metabolites, and induce damage of lung parenchyma[6,30,31].

Although pulmonary involvement is well described in the literature, the evaluation and treatment of pulmonary disease associated with IBD remain a problem. The pulmonary associations of IBD are poorly characterized and early recognition is important[32]. Here, we review the pulmonary manifestations that are associated with IBD.

## PULMONARY DISEASES ASSOCIATED WITH IBD

### *Airway diseases*

Airway disease from the trachea to the bronchioles has been reported in association with IBD[29,33-50]. IBD was four times more prevalent among patients with airways disease compared with published local IBD prevalence in a retrospective analysis of outpatients over a 10-year period[51]. The pathogenesis of IBD-related airway disease is unknown, but it is clearly inflammatory in nature. Severe tracheal inflammation and obstruction are rare manifestations of IBD and correspond to the presence of irregularly friable and hemorrhagic tissue at endoscopy[52]. The tracheal epithelium is often ulcerated and is replaced by a thin layer of fibrin. The main symptoms are coughing, dyspnea, stridor and hoarseness[42]. Upper airway involvement comprises glottic/subglottic stenosis, tracheal inflammation and stenosis[13,40,42,43]. Most of this rare entity involves the trachea, presenting with shortness of breath, dysphonia, and cough[45,46,53]. It can often be identified by history, complemented by a clear X-ray film and obstructive pattern on pulmonary function testing. Laryngoscopic evaluation is necessary because airway compromise can occur. The mucosa may exhibit a cobblestone appearance similar to that seen in affected intestines[54]. Chest radiographs and computed tomography (CT) may show narrowing of any portion of the trachea, with circumferential tracheal wall thickening on CT[27]. No predilection seems to exist for specific gender or type of bowel disease.

Large airway disease, strongly associated with UC[18], is the most common presentation of pulmonary manifestations. Bronchial inflammation and suppuration are the most common manifestations of pulmonary involvement in IBD and include chronic bronchitis and bronchiectasis in which bronchial dilatation is visualized on chest X-ray or CT scan. Bronchiectasis is the most commonly reported entity and is noted in 66% of cases of IBD involving the large airways[13,34,35,39,50]. Infrequently, in IBD patients developing new, persistent and unexplained symptoms of respiratory disease, particularly chronic productive cough, the presence of bronchiectasis may be demonstrated[18]. The majority of patients with bronchiectasis have UC. IBD is inactive in many cases and curiously, in 60% of patients, the symptoms develop a few days to a few weeks following colectomy[39,42,55]. The second most common

large airway disease in IBD is chronic bronchitis, which is distinguished from bronchiectasis only by the degree and extent of pulmonary abnormality[56], and further abnormalities include suppurative large airway disease and acute bronchitis. The main symptom is chronic cough with purulent sputum poorly responsive to antibiotics[57]. Bronchial biopsy shows similar features: squamous cell metaplasia in the mucosa that is sometimes infiltrated by neutrophils and a dense cuff of lymphocytes and plasma cells infiltrating the submucosa[8].

Clinically, small airway disease is less frequently reported and is described as occurring in isolation from large airway disease. However, the recent advent of high-resolution CT has increased the detection of small airway involvement in these patients. These abnormalities seem to occur earlier in the course of the disease and at a younger age than large airway disease[41,47-49,58-60]. Moreover, small airway disease is more frequently apparent before the onset of IBD than other airway diseases[48]. CT shows bronchiolar wall thickening, mucoid impaction, centrilobular ground-glass nodules, and mosaic attenuation because of air trapping, and some patients have normal pulmonary function test (PFT) findings[32].

Bronchiolitis is an inflammatory and potentially fibrosing condition affecting mainly the intralobular conducting and transitional small airways[61]. Among small airway diseases are associated with IBD, bronchiolitis is the most frequently detected[62,63]. Chronic bronchiolitis contributes to morbidity and/or mortality if it persists and/or progresses to diffuse airway narrowing and distortion or complete obliteration. Bronchiolitis in specific settings leads to bronchiolectasis, resulting in bronchiectasis. The main symptoms of bronchiolitis associated with IBD include mild productive cough and chronic bronchorrhea; wheezes are heard at auscultation. Small airway involvement can precipitate abnormalities on PFTs. Histological samples show varied patterns ranging from nonspecific fibrosing and stenosing bronchiolitis to an inflammatory lesion indistinguishable from the original description of panbronchiolitis[8]. The CT appearances coupled with the evaluation of pulmonary function parameters usually lead to the diagnosis.

In IBD-related large airways disease, steroid drugs are effective, but recommendations for their use including dosage, duration and route of administration remain empirical. Steroids are the major therapy although some patients do not require systemic therapy. Clinical improvement with inhaled steroids alone or in combination with systemic steroids has been reported[8,29,43,64]. Ineffectiveness of inhaled corticosteroids may be due to airways filled with inspissated secretions, in which case either topical corticosteroids via bronchoalveolar lavage (BAL) or systemic corticosteroids are recommended[57]. Broadly speaking, inhaled steroids seem more effective and are better tolerated than oral steroids. Rarely, other forms of immunomodulation have been used to treat IBD-related airway disease[65]. Small airway disease is usually refractory to inhaled steroids, and the improvement brought about by oral steroids ranges from slight to modest[8]. Lung transplantation has been required in some cases. Surgery of the colon, which may aggravate prior airway disease[37], is not recommended for treatment of airway disease.

### *Lung parenchymal diseases*

Lung parenchymal disease associated with IBD is relatively uncommon. Analysis of diffuse lung disease in IBD patients is further confounded by documented pulmonary sequelae to various medical therapies used to treat IBD. In contrast to other extraintestinal manifestations, lung parenchymal disease associated with IBD is seen more commonly with UC than CD[8]. Age of onset varies, and there is a slight female predominance.

BOOP is the most commonly reported parenchymal manifestation of IBD[63,66-69]. BOOP is often caused by inhalation injury, or results from a post-infection origin or drugs and may present acutely or subacutely with fever, cough, dyspnea and pleuritic chest pain[15,70,71]. Chest radiography shows focal to diffuse peripheral predominant airspace opacities. CT shows scattered, nonsegmental, unilateral, or bilateral foci of consolidation, ill-defined centrilobular nodules, and large irregular nodules. It can be associated with other autoimmune diseases such as rheumatoid arthritis, lupus and Wegener's granulomatosis. Dyspnea and cough are the most common presenting symptoms. Systemic steroids are recommended for treatment but BOOP may also remit without treatment in a minority of cases[13].

Other forms of parenchymal disease that may be related to IBD or drug toxicity are eosinophilic pneumonia and nonspecific interstitial pneumonitis. Although interstitial disease most commonly involves drug-induced reactions with mesalamine and sulfasalazine, a small number of unrelated cases of fibrosing alveolitis and eosinophilic pneumonia have been reported[72-77]. On CT, peripheral consolidation predominates in cases of eosinophilic pneumonia, whereas nonspecific interstitial pneumonitis shows ground-glass opacities, interlobular septal thickening, and irregular linear opacities[78]. The interstitial lung infiltrates have been proven histologically to be either pulmonary vasculitis[79-81] or more often granulomatous disease[82-85].

Pulmonary nodules have been infrequently reported in patients with IBD. Histologically, these lesions have been reported to be necrobiotic, granulomatous, or otherwise[86]. Necrobiotic nodules, composed of sterile aggregates of neutrophils with necrosis, may also be seen in rheumatoid arthritis, Wegener's granulomatosis, or septic pulmonary emboli, and should be differentiated from malignancy and infection. An infectious origin should be excluded because necrobiotic nodules will respond to steroids but not to antibiotics. Sarcoidosis and CD are both granulomatous diseases, of the lung and bowel, respectively. It is not surprising that these two diseases may simultaneously appear in the same patient, with pulmonary involvement[87], even though this happens rarely and the two diseases usually follow an independent clinical course[88]. An infectious cause, specifically atypical *Mycobacterium* has been postulated to contribute to granuloma

formation in both sarcoidosis and CD, and has even been detected in tissues from patients with both diseases[89].

The manifestations of lung parenchymal disease in IBD usually respond dramatically to inhaled and/or systemic steroids. Steroids administered orally lead to marked improvement in patients with interstitial lung disease, BOOP, pulmonary infiltrates with eosinophilia, and necrotic nodules. Intravenous steroids are required in the initial management of life-threatening complications such as extensive interstitial lung disease. The addition of cyclophosphamide or infliximab may show rapid clinical and radiological response and are well tolerated in some cases[90,91].

### Thromboembolic diseases

IBD is a chronic inflammatory condition, characterized by microvascular and macrovascular involvement. Inflammation and immune response could lead to endothelial dysfunction, which is the earliest stage of the atherosclerotic process[92]. Chronically inflamed intestinal microvessels of IBD patients have demonstrated significant alterations in their physiology and function compared with vessels from healthy and uninvolved IBD intestine[93]. Thromboembolism is an extraintestinal manifestation and an important cause of mortality in IBD[94]. The incidence of thromboembolic events in IBD patients is three to four times higher than in age-matched control subjects[95,96]. It happens at an earlier age than in non-IBD patients. The majority of thromboembolic events among IBD patients are venous thromboembolism, manifested as either deep venous thrombosis or pulmonary embolism, but arterial thromboembolism and venous thrombosis at unusual sites have also been reported[97]. Prothrombotic risk factors in IBD patients could be distinguished as acquired, such as active inflammation, immobility, surgery, steroid therapy, and use of central venous catheters, and inherited[93].

The risk of thromboembolism appears to be multifactorial and related to mucosal inflammatory activity in most patients. Pulmonary embolism should be always considered in IBD patients with breathing difficulties. However, the diagnosis of venous and arterial thromboembolism is extremely challenging and requires a high degree of vigilance. Deep vein thrombosis and pulmonary embolism may be clinically silent or manifest with only a few specific symptoms. Up to one-third of thromboembolic events in this population occur while IBD is quiescent, suggesting an unknown risk factor that is unrelated to treatment or disease activity[13]. The pathogenesis of increased thrombotic risk among patients with IBD is unclear. About 80% of IBD patients have active disease when pulmonary embolism occurs[98]. Early diagnosis plays a central role in optimizing the therapeutic intervention and reducing the risk of short-term and long-term thrombosis-associated complications. The decision regarding the duration of systemic anticoagulation must take into account the individual risk of intestinal bleeding[99].

### Pleural diseases

Rarely, IBD involves the pleural space and pericardium, causing inflammatory exudative pleural and/or pericardial effusions[100,101]. This is a relatively rare presentation of the uncommon and probably under-reported and under-recognized pulmonary extraintestinal manifestations of IBD[102]. Pleuropericardial inflammatory disease and effusion can be directly related to IBD, its complications, associated infections, or the medications used to treat it[103]. Most patients are young, male, and have UC during the quiescent phase of the disease. The manifestations of pleural disease can be classified as: pneumothorax[104], pleural thickening[105], pleuritis, and pleural effusion[106]. Pleural fluid directly related to IBD is usually unilateral, an exudate with neutrophils, and may be hemorrhagic. Mesalazine may also induce lupus-like symptoms, such as arthralgia, pericarditis, tamponade, and/or pleural effusion, with positive antinuclear antibody[107]. It is important to evaluate pleural effusion and rule out other etiologies before making this diagnosis. Pleural or pericardial biopsies are rarely necessary, and probably show nonspecific acute and chronic inflammatory changes[103]. Although the specific pathophysiology of pleuropericardial disease in patients with IBD remains unclear, the response to systemic steroids is usually adequate. However, pleural drainage may be required occasionally.

### Enteric-pulmonary fistulas

Fistula formation is frequent in CD and occurs in 33% of patients[107]. Most of the fistulas appear in the perineal area[108]; to date, only a few reports (mostly as single cases) are available on the occurrence of enteric-pulmonary fistulas in IBD, such as colobronchial[109-112], ileobronchial[113], and esophagobronchial[114,115] fistulas. In most cases, colobronchial fistulas extend from the splenic flexure in the colon to the lower lobe of the left lung. This is likely due to the anatomical proximity between the two structures. However, Mercadal *et al*[116] reported a rare case of right-sided colobronchial fistula in a 47-year-old, severely malnourished man with a history of regional enteritis and recurrent right lower and middle lobe pneumonia, medically managed with the addition of the immunomodulator infliximab prior to surgery.

Diagnosis of fecopneumothorax is based on meticulous clinical examination and additional diagnostic procedures. Recurrent pneumonia with feculent sputum in patients with CD should raise suspicion of colobronchial fistula. Once the abnormal connections between the bowel and respiratory tract are suspected, an enema using water-soluble contrast medium certainly helps to confirm the presence of fistulas[110]. Abdominal and thoracic CT scan or magnetic resonance imaging could provide additional information about the stage of the disease and exclude the presence of abscess or fluid collection in the abdominal cavity. Colopleural fistula and fecopneumothorax are rare but life-threatening complications of CD[117]. Surgical treatment is mandatory as soon as the diagnosis is established[118].

### Pulmonary function test abnormalities

PFT abnormalities are found frequently in patients with

IBD without presence of any respiratory symptoms and lung radiograph findings[20]. IBD patients show significantly decreased lung function tests in comparison to healthy controls. In a review including over 600 patients with UC, more than 50% of patients showed abnormal PFT results when compared to healthy controls, and the decrease in diffusion capacity of the lung for carbon monoxide (DLCO) was the most common defect[15]. Various studies testing pulmonary function in patients with IBD have revealed a spectrum of abnormalities including restrictive disease, obstructive disease, bronchial hyperresponsiveness and hyperinflation as well as a decreased diffusion capacity of the lung[119-133]. The severity and frequency of these PFT abnormalities that are detected even in the remission periods increase with disease activity. There is no difference between UC and CD in PFTs[51], and smoking status is not predictive of these abnormalities.

The most commonly described abnormality is a decrease in lung diffusion capacity[66]. In most studies, this alteration could not be predicted by current or past smoking status, occupational history, or current medication use. Lung transfer factor for carbon monoxide abnormalities is related to the degree of disease activity[122]. Pulmonary involvement in IBD is often asymptomatic and detectable only at the time of lung function investigation. This is further supported by the finding of Wallaert *et al*[134] of a high proportion of latent lymphocytic pulmonary alveolitis in the BAL of 18 consecutive patients with CD; all free from respiratory symptoms and showing normal chest X-ray. Therefore, PFT may be used as a noninvasive diagnostic procedure in determining the activation of IBD and might aid early diagnosis of latent respiratory involvement[135]. Early recognition is important, because PFT abnormalities can be steroid responsive[136].

PFT studies in IBD suggest that subclinical pulmonary disease may be present in a large subpopulation of patients. A high degree of suspicion is necessary to detect the pulmonary abnormalities in IBD, because a large proportion of symptom-free patients have abnormal findings on pulmonary function testing. Although the mechanism of these abnormalities remains unclear, it may be a result of the increased capacity of alveolar macrophages to produce superoxide anions, which has been shown in some patients with CD[137].

## DRUG-RELATED LUNG DISEASES

Although drug-related diseases are not "proper" IBD-associated diseases, because IBD patients use several drugs for prolonged periods of time, it is not surprising that some of these may also cause problems to the lungs. Therefore, this type of pathology must be kept in mind for patients taking azathioprine (AZA), 6-mercaptopurine (6-MP), sulfasalazine, mesalamine, methotrexate, and anti-TNF-α.

### AZA and 6-MP

AZA and 6-MP are therapeutic options for patients with moderate to severe IBD[138]. However, between 10% and 29% of patients treated with these drugs are forced to stop therapy due to side effects. Pulmonary toxicity due to these drugs has been reported infrequently in the literature, although interstitial pneumonitis[139], BOOP[140], chronic pneumonitis/fibrosis and pulmonary edema[141] have been described after use of AZA and 6-MP. Although rare, AZA and 6-MP can cause direct, dose-dependent and serious pulmonary toxicity[140,142]. The largest number of cases of lung toxicity related to AZA was described in seven patients undergoing renal allograft transplant immunosuppression with AZA[142]. Lung biopsies revealed interstitial pneumonitis in 5 patients and diffuse alveolar damage in 2; 3 patients died and the other 4 improved after stopping AZA, and in 2 of these patients, cyclophosphamide therapy was needed to resolve this side effect completely. Thus, it is important for clinicians to have a high index of suspicion for this adverse reaction, which occurs within 1 mo after purine analog use in IBD.

### Sulfasalazine and mesalamine

Sulfasalazine and mesalamine are commonly used medications for the long-term treatment of IBD, and their side effects may be dose-related or idiosyncratic and should be differentiated from the respiratory involvement occurring in IBD and due to the underlying disease, although this is challenging because they share similar pathological features[47]. Commonly reported lung pathology related to the use of these compounds is mostly due to interstitial disease[54,128,143-145], although eosinophilic pleuritis[146], eosinophilic pneumonia[71,147-150], and bronchiolitis obliterans[67] have also been described. Patients present with progressive respiratory symptoms such as dyspnea, chest pain and cough, and radiographic abnormalities. Alternatively, sulfasalazine and mesalamine may induce asymptomatic lung injury more commonly than is presently suspected[151]. Although sulfasalazine or mesalazine-induced lung injury is a rare entity, its possibility should be fully considered in patients developing unexplained respiratory symptoms while on sulfasalazine or mesalazine therapy[150]. In most cases, symptoms appear after 2-6 mo of drug use, whereas in a few cases they appear after a few days or after many years. These pulmonary toxicities appear reversible after withdrawal of the drug, and in some cases, with the use of systemic corticosteroids[152,153].

### Methotrexate

Methotrexate (MTX) may be useful in the treatment of IBD[154], but can cause adverse effects in the lungs, which in some cases are lethal[155]. The mechanism of MTX-induced lung pathology remains unclear. A hypersensitivity reaction was suggested by lung biopsy findings: interstitial pneumonitis, granuloma formation and bronchiolitis[156], and by BAL findings: lymphocytic alveolitis, increased eosinophils and reversed CD4/CD8 ratio[157], together with the clinical findings of fever, peripheral eosinophilia and response to corticosteroids. MTX may also cause pneumonitis[158], and abnormal ventilation is an early sign and should lead to further investigation[159]. The diagnosis of

MTX-induced lung disease is difficult because there are no pathognomonic findings and this condition may mimic other pulmonary diseases. The most frequent complaints include dyspnea, fever and nonproductive cough. PFTs show a restrictive picture with low CO diffusion capacity. MTX-related lung toxicity is potentially fatal, thus, regular monitoring of the status of the respiratory system in MTX-treated patients is necessary and patients should be instructed to report any new pulmonary symptoms without delay[160]. Besides supportive therapy, withdrawal of MTX seems to be a logical approach.

### *Biological therapy*

Biological therapy with anti-TNF drugs such as infliximab, adalimumab and certolizumab has represented a significant advance in the treatment of IBD over the past few years[161-163]. However, serious side effects do occur, necessitating careful monitoring of therapy[164]. Several associated opportunistic infections have been observed as a result of suppression of T-cell-mediated immunity; the most frequent being tuberculosis[165-167]. Physicians should be aware of the increased risk of reactivation of tuberculosis in patients treated with anti-TNF agents and regularly look for usual and unusual symptoms of tuberculosis. Moreover, the use of biological therapy has been associated with *Pneumocystis carinii* pneumonia[168], as well as with other pulmonary infections (coccidiomycosis, histoplasmosis, aspergillosis, nocardia asteroids, actinomycosis and listeriosis)[169-173], especially in older patients[174].

Although infective complications are the most feared after the use of biological agents, these may induce other uncommon effects in the lung, such as acute respiratory distress syndrome[175], diffuse alveolar hemorrhage[176], non-bronchiolitis inflammatory nodular pattern of the lung[177], and interstitial lung disease[178-180]. Close observation of patients undergoing treatment with TNF inhibitors for evolving signs and symptoms of autoimmunity is required. Organ involvement is unpredictable, which makes correct diagnosis and management extremely challenging.

## CONCLUSION

Pulmonary manifestations of IBD are being increasingly recognized. The involvement of the respiratory system in IBD, which can range from a simple defect of pulmonary function without symptoms, to fibrosing alveolitis with a greater risk of mortality, is relatively rare but sometimes potentially harmful. Early identification of latent pulmonary involvement is important to prevent future and more severe respiratory impairment and can be life-saving. The manifestations in the lung vary and often represent a confounding diagnostic problem. It is imperative for clinicians to maintain a high index of suspicion for the development of pulmonary disease in the setting of IBD in order to institute appropriate treatment early and avoid further complications and morbidity in IBD patients, and to recognize prompt treatment for these events. Steroids are effective in the majority of cases.

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