



Renal dysfunction in pulmonary cancer patients; a mini-review

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Abstract

Early detection of renal dysfunction can help clinicians plan optimal treatment strategies to manage the underlying cause, such as a paraneoplastic syndrome or tumor lysis syndrome. Effective management of renal dysfunction can help improve overall clinical outcomes of the lung cancer patient.

Keywords: Renal dysfunction, Lung cancer, Paraneoplastic syndrome, Hypercalcemia, Kidney dysfunction, Tumor lysis syndrome, Metastasis, Small cell carcinoma, Acute kidney injury

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Introduction

Lung cancer can present with different renal manifestations due to various mechanisms such as direct invasion or paraneoplastic syndromes. The treatment will depend on the underlying cause. Early detection of renal dysfunction in lung cancer patients is essential for prompt intervention, which can improve clinical outcomes (1-3). In this mini-review, we sought to study the recent data on renal dysfunction in pulmonary cancer patients.

Search strategy

For this review, we searched PubMed, Web of Science, EBSCO, Scopus, Google Scholar, Directory of Open Access Journals (DOAJ) and Embase, using different keywords including; lung cancer, paraneoplastic syndrome, renal dysfunction, hypercalcemia, kidney dysfunction, tumor lysis syndrome, metastasis, small cell carcinoma, acute kidney injury, pulmonary cancer and electrolyte imbalances,

Impact of lung cancer on renal function and structure

Lung cancer can cause renal dysfunction due to the various reasons, including; nephrotic syndrome, which resulting in edema and hypoalbuminemia (4). One of the paraneoplastic syndromes associated with lung cancer is membranous nephropathy that can present as nephrotic syndrome. This is due to the production of autoantibodies against phospholipase A2 receptor by the neoplastic cells. In addition, pulmonary cancers, particularly small

cell carcinoma, can cause renal failure due to tumor lysis syndrome (5). Tumor lysis syndrome happens when cancer cells break down; release their contents into the bloodstream, and cause electrolyte imbalances and kidney dysfunction (6,7). Moreover, lung cancer can cause hypercalcemia, due to metastasis involving the bone or the secretion of parathyroid hormone-related protein by neoplastic cells (8). Furthermore, lung cancer can cause obstruction to the urinary tract when it invades or compresses adjacent structures such as the ureters or bladder. This obstruction causes backpressure on the kidneys leading to hydronephrosis and an increase in serum creatinine (9,10). Likewise, pulmonary cancer can cause glomerulonephritis. This is usually a result of immune complex deposition but can also occur due to direct tumor invasion (11,12). Additionally, tumor lysis syndrome is a metabolic complication that can occur due to the rapid breakdown of cancer cells leading to the release of their intracellular contents, including potassium, phosphate, and uric acid. The renal tubules cannot handle this sudden osmotic load, which leads to acute kidney injury (6,7). Accordingly, some lung cancers can cause paraneoplastic syndromes, which are a group of rare disorders that result from the production of hormones, proteins, or other molecules by cancer cells that affect organ function distal to the original tumor site. Certain paraneoplastic syndromes, such as nephrotic syndrome and glomerulonephritis, can impair renal function (1,13). Other uncommon conditions are consisted of direct

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■ Implication for health policy/practice/research/medical education

Early detection of renal dysfunction in pulmonary cancer patients is essential for optimal treatment, prevention of complications, and monitoring of drug toxicity. Early intervention can improve clinical outcomes and patients' overall quality of life.

invasion of the tumor into the kidneys can cause local destruction of the renal parenchyma, leading to renal dysfunction or metastasis of pulmonary cancer to other organs, including the kidneys, causing kidney dysfunction (14,15).

The importance of renal dysfunction in lung cancers

Early detection of renal dysfunction in lung cancer patients is important for several reasons:

1. Treatment planning: Early detection of renal dysfunction can help clinicians plan optimal treatment strategies to manage the underlying cause, such as a paraneoplastic syndrome or tumor lysis syndrome. Effective management of renal dysfunction can help improve overall clinical outcomes of the lung cancer patient (16-18).
2. Preventing dehydration: Renal dysfunction, especially acute kidney injury, can cause fluid imbalances and dehydration, thereby putting a strain on the heart and other vital organs. Early detection of renal dysfunction enables clinicians to start appropriate fluid management and prevention of dehydration in lung cancer patients (19,20).
3. Avoiding complications: Untreated renal dysfunction can lead to various complications, such as metabolic acidosis, electrolyte disturbances, and fluid overload, leading to respiratory distress, cardiovascular instability, and even death. Early detection and prompt intervention can help to mitigate these complications (21,22).
4. Monitoring drug toxicity: The kidneys eliminate several drugs that administered in the treatment of pulmonary cancers; hence, their dose must be adjusted concerning renal function. Early detection of renal dysfunction allows clinicians to monitor drug toxicity and adjust dosing regimens appropriately, minimizing side effects and maximizing the efficacy of treatment (23,24).
5. Identification of other renal disorders: Lung cancer patients with renal dysfunction can also have other comorbid renal conditions that require review and assessment, such as diabetic nephropathy or renal artery stenosis. Early detection can help initiate workups for such conditions that may have gone unnoticed or untreated (25-27).

Untreated renal dysfunction in lung cancer patients can lead to various complications, including electrolyte imbalances, hypertension, acid-base disorders, fluid

overload, uremia, cardiovascular complications, and infections. Early detection and prompt intervention can help avert these complications and improve clinical outcomes (28-31).

Renal presentations of lung cancer

Untreated renal dysfunction in lung cancer patients can lead to various complications. Untreated renal dysfunction can lead to electrolyte imbalances, such as hyperkalemia or hyponatremia, which may lead to serious complications such as cardiac arrhythmias or seizures (31,32). The kidneys also help regulate blood pressure. Renal dysfunction can lead to hypertension or worsening of preexisting hypertension, which can increase the risk of developing cardiovascular disease (33,34). Moreover, renal dysfunction can lead to acid-base imbalances, such as metabolic acidosis, which can cause fatigue, confusion, and muscle weakness. Renal dysfunction can also lead to fluid overload, which can cause edema, shortness of breath, and even pulmonary edema, leading to respiratory distress (29,35). Similarly, untreated renal dysfunction directed to accumulation of waste products in the body, leading to uremia. Uremia can cause fatigue, nausea, confusion, and can progress to a life-threatening condition (22). Furthermore, renal dysfunction can increase the risk of cardiovascular diseases such as myocardial infarction, heart failure, and stroke. Finally, kidney dysfunction can weaken the immune system, making patients more susceptible to infections (36,37).

Conclusion

Renal presentations of lung cancer are due to direct tumor invasion or paraneoplastic syndromes. Early detection and appropriate management of these renal manifestations can help in improving clinical outcomes for patients with lung cancer.

Conflicts of interest

The author declares no conflict of interest related to the subject matter or materials discussed in this paper.

Ethical issues

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