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Acute and chronic kidney disease in lung cancer; an update

Niloufar Hooshyar[1,2], **Shakiba Hassanzadeh**[1], **Hamid Nasri**[1,2*]

Abstract
Lung cancer, the most common cause of death due to malignancy, mostly presents in older individuals. Therefore, there is usually the coexistence of comorbidities such as diabetes, hypertension, or renal and heart failure. On the other hand, lung cancer affects various organs including the kidney; however, the mechanism is still not fully understood. We give an overview of the renal involvement in patients with lung cancers.

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Introduction

The worldwide leading cause of mortality due to malignancy is lung cancer. The prognosis of lung cancer depends on various factors such as the severity of the underlying comorbidities and the stage of the lung cancer. Since lung cancer mostly presents in older individuals (aged 65–74 years), other comorbidities such as diabetes, hypertension, and some degrees of renal or heart failure are also usually observed in these patients. Therefore, various factors like the type of chemotherapy or supportive therapy, side effects, adjuvant radiotherapy, or resection may be impacted by these comorbidities, which may decrease the survival of older patients compared to the youth (1,2). For example, Kale et al reported a four- to six-fold increase in chemotherapy-induced toxicity in older patients with an advanced stage of lung cancer (3). Lung cancer affects various organs including the kidney; however, the exact mechanism is still unclear. Various types of renal involvements have been reported in patients with lung cancer including acute kidney injury (AKI) and chronic kidney disease (CKD). Therefore, we aimed to give an overview of the renal involvement in patients with lung cancers.

Search strategy

For this mini-review, we searched DOAJ (Directory of Open Access Journals), PubMed/Medline, Web of Science, Scopus, Embase and Google Scholar, using keywords including; acute kidney injury, chronic kidney disease, lung cancer, hypercalcemia and glomerulopathy.

Acute kidney injury in lung cancer

AKI is caused by pre-renal, intrinsic, or post-renal injuries. Pre-renal circumstances are more commonly observed such as dehydration following vomiting. Post-renal causes of AKI in cancer patients could be due to prostate enlargement in men or pelvic obstruction in females. The etiology of intrinsic kidney disease in patients with lung cancer is multifactorial including chemotherapy or antimicrobial agents, or metabolic disorders like hypercalcemia and tumor lysis syndrome. However, immunological events such as glomerulopathy due to a paraneoplastic syndrome or vasculitis may be the cause as well. In addition, tubular-obstructive diseases such as cast nephropathy, thrombotic microangiopathy, and renal vein thrombosis or vena cava thrombosis due to tumor proliferation and infiltration may also cause AKI. In some cases, AKI may occur following the tumor infiltration of the renal interstitium similar to in lymphomas or leukemia (4-6). Rarely, neuroendocrine small cell tumors cause proteinuria, direct infiltration, or distant metastasis from the tumor, resulting in secretory diarrhea, and consequently pre-renal azotemia (6). Some paraneoplastic disorders are also associated with AKI including SIADH (syndrome of inappropriate secretion of antidiuretic hormone), LEMS (Lambert-Eaton myasthenic syndrome), and ectopic ACTH (adrenocorticotropic hormone syndrome) (6).

On the other hand, the kidneys receive around 25% of the cardiac output and, therefore, they are susceptible to hematogenous metastasis. Lung, breast, and gastric cancers are the most common solid tumors that metastasize to

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[1]Nickan Research Institute, Isfahan, Iran. [2]Department of Internal Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.
***Corresponding Author:** Prof. Hamid Nasri, Email: hamidnasri@yahoo.com, hamidnasri@med.mui.ac.ir

Implication for health policy/practice/research/ medical education

Lung cancer, the most common cause of death due to malignancy, mostly presents in older individuals that usually have comorbidities. Lung cancer affects the kidney and various types of renal involvements have been detected in patients with lung cancer including acute kidney injury and chronic kidney disease.

the kidneys, in sequence. (7). AKI may result from the disruption of the vascular and tissue structure caused by the bilateral interstitial infiltration of the kidneys by malignant cells. However, AKI may recover with an immediate diagnosis of the underlying malignancy and proper treatment (7,8).

Chronic kidney disease in lung cancer

It has been reported that comorbidities influence the survival of patients with pulmonary cancers. Some parameters such as the age at cancer presentation or gender are important risk factors in the mortality of patients with pulmonary tumors because of their impact on the incidence of comorbidities, such as diabetes mellitus, hypertension, smoking, cardiovascular and cerebrovascular disorders. Additionally, the aforementioned conditions may influence the type of chemotherapy regimen and the patient's response (1, 2, 9). Chemotherapy is the treatment of choice for lung cancers. However, other drugs such as cyclophosphamide, doxorubicin, hydrochloride, vincristine sulfate, cisplatin, and etoposide are also commonly administered (6). Recently, the impact of CKD on the mortality of cancer patients has gained more attention. CKD is characterized by various chronic and irreversible damages which lead to renal dysfunction over some time (months or years). Therefore, CKD is defined as at least three months of continued decrease in kidney function [glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m^2] and structural disruption. Some studies have reported renal failure as a major risk factor for mortality in patients with some types of cancers; however, its effect on lung cancer is still unclear. Moreover, it has been reported that the coexistence of CKD and other tumors increases surgical complications and mortality, and reduces the overall survival in various tumors (8). However, in a retrospective study on 107 patients that had lung cancer and CKD, Patel et al reported that CKD did not affect the clinical prognosis or survival of these patients compared to those that had lung cancer but no CKD (10).

Conclusion

Lung cancer is the most common cause of mortality due to malignant disorders, mostly presents in older individuals that usually have comorbidities. Lung cancer affects the renal system and various types of kidney involvements have been detected in patients with lung cancer including AKI and CKD.

Authors' contribution

The primary draft was conducted by NH and HN. Scientific editing was conducted by SH. All authors have read, signed, and approved the final paper

Conflicts of interest

The authors declare that they have no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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References

1. Iachina M, Jakobsen E, Møller H, Lüchtenborg M, Mellemgaard A, Krasnik M, et al. The effect of different comorbidities on survival of non-small cells lung cancer patients. Lung. 2015;193:291-7. doi: 10.1007/s00408-014-9675-5.
2. Sagerup CM, Småstuen M, Johannesen TB, Helland Å, Brustugun OT. Sex-specific trends in lung cancer incidence and survival: a population study of 40,118 cases. Thorax. 2011;66:301-7. doi: 10.1136/thx.2010.151621.
3. Kale MS, Mhango G, Gomez JE, Sigel K, Smith CB, Bonomi M, et al. Treatment Toxicity in Elderly Patients With Advanced Non-Small Cell Lung Cancer. Am J Clin Oncol. 2017;40:470-6. doi: 10.1097/COC.0000000000000188.
4. Törnroth T, Heiro M, Marcussen N, Franssila K. Lymphomas diagnosed by percutaneous kidney biopsy. Am J Kidney Dis. 2003;42:960-71. doi: 10.1016/j.ajkd.2003.08.004.
5. Stebbing J, Smith IE. Small cell lung cancer as a cause of acute renal failure secondary to bilateral renal infiltration. Clin Oncol (R Coll Radiol). 2000;12:326-7. doi: 10.1053/clon.2000.9184.
6. Baig WW, Attur RP, Gundlapalli S, Karanam G, Rao L, Valiathan M. Combined neuroendocrine small cell carcinoma of trachea with crescentic glomerulonephritis as a paraneoplastic manifestation. Respiratory Medicine CME. 2008;1:228-30. doi: 10.1016/j.rmedc.2008.07.012.
7. Manning EC, Belenko MI, Frauenhoffer EE, Ahsan N. Acute renal failure secondary to solid tumor renal metastases: Cases report and review of the literature. Am J Kidney Dis. 1996;27:284-91. doi: 10.1016/S0272-6386(96)90555-7.
8. Wen Y-K, Chen M-L. Acute Renal Failure Secondary to Small Cell Lung Cancer with Tumor Infiltration of the Kidneys. Renal Failure. 2006;28:261-4. doi: 10.1080/08860220600580423.
9. Dima S, Chen K-H, Wang K-J, Wang K-M, Teng N-C. Effect of Comorbidity on Lung Cancer Diagnosis Timing and Mortality: A Nationwide Population-Based Cohort Study in Taiwan. BioMed Research International. 2018;2018:1252897. doi: 10.1155/2018/1252897.
10. Patel P, Henry LL, Ganti AK, Potti A. Clinical course of lung cancer in patients with chronic kidney disease. Lung Cancer. 2004;43:297-300. doi: 10.1016/j.lungcan.2003.08.029.