

World Journal of *Clinical Cases*

World J Clin Cases 2022 February 26; 10(6): 1754-2052



Contents

Thrice Monthly Volume 10 Number 6 February 26, 2022

OPINION REVIEW

- 1754 Gut-brain axis: Focus on gut metabolites short-chain fatty acids
Guo C, Huo YJ, Li Y, Han Y, Zhou D

MINIREVIEWS

- 1764 Association between direct-acting antiviral agents in hepatitis C virus treatment and hepatocellular carcinoma occurrence and recurrence: The endless debate
Kamal A, Elsheaita A, Abdelnabi M

ORIGINAL ARTICLE

Retrospective Cohort Study

- 1775 Effects of bilirubin on perioperative myocardial infarction and its long-term prognosis in patients undergoing percutaneous coronary intervention
Li Y, Li DB, Zhao LD, Lv QB, Wang Y, Ren YF, Zhang WB
- 1787 Disease exacerbation is common in inflammatory bowel disease patients treated with immune checkpoint inhibitors for malignancy
Rubin SJS, Balabanis T, Gubatan J, Habtezion A
- 1795 Multidrug-resistant organisms in intensive care units and logistic analysis of risk factors
Han Y, Zhang J, Zhang HZ, Zhang XY, Wang YM

Retrospective Study

- 1806 Change and impact of left ventricular global longitudinal strain during transcatheter aortic valve implantation
Zhang H, Xie JJ, Li RJ, Wang YL, Niu BR, Song L, Li J, Yang Y

Observational Study

- 1815 Early detection of noise-induced hearing loss
Meng ZL, Chen F, Zhao F, Gu HL, Zheng Y
- 1826 Empathetic nursing with mindful cognitive therapy for fatigue, depression, and negative emotions in leukemia patients undergoing long-term chemotherapy
Lu YY, Lu XM, Shao CY, Wang CC, Xu TT, Zhang BL

Prospective Study

- 1834 Superior pancreatic lymphadenectomy with portal vein priority *via* posterior common hepatic artery approach in laparoscopic radical gastrectomy
Zhang YJ, Xiang RC, Li J, Liu Y, Xie SM, An L, Li HL, Mai G

Randomized Controlled Trial

- 1843** Systematic nursing interventions in gastric cancer: A randomized controlled study
He F, He RX

META-ANALYSIS

- 1852** Impact of adding opioids to paravertebral blocks in breast cancer surgery patients: A systematic review and meta-analysis
Chen MH, Chen Z, Zhao D

CASE REPORT

- 1863** Multiple different remote epidural hematomas after craniotomy: A case report
He Q, Tao CY, Fu RH, You C
- 1869** Tuberculous pericarditis-a silent and challenging disease: A case report
Lucero OD, Bustos MM, Ariza Rodríguez DJ, Perez JC
- 1876** Transileocolic endovascular treatment by a hybrid approach for severe acute portal vein thrombosis with bowel necrosis: Two case reports
Shirai S, Ueda T, Sugihara F, Yasui D, Saito H, Furuki H, Kim S, Yoshida H, Yokobori S, Hayashi H, Kumita SI
- 1883** Efficacy of EGFR-TKI sequential therapy in patients with EGFR exon 19 insertion-positive non-small-cell lung cancer: A case report
Shan BB, Li Y, Zhao C, An XQ, Zhang QM
- 1889** Novel compound heterozygous variants in the TAF6 gene in a patient with Alazami-Yuan syndrome: A case report
Lin SZ, Feng JH, Sun LP, Ma HW, Wang WQ, Li JY
- 1896** Asymmetric limb weakness in Guillain-Barré syndrome: Three case reports
Hu M, Li X, Wong HY, Feng XG, Wang YZ, Zhang GR
- 1903** Modified treatment of knee osteoarthritis complicated with femoral varus deformity: A case report
Xu SM, Li W, Zhang DB, Bi HY, Gu GS
- 1909** Novel HNF1A gene mutation in maturity-onset diabetes of the young: A case report
Xu Q, Kan CX, Hou NN, Sun XD
- 1914** Cerebral corridor creator for resection of trigone ventricular tumors: Two case reports
Liu XW, Lu WR, Zhang TY, Hou XS, Fa ZQ, Zhang SZ
- 1922** Left abdominal wall proliferative myositis resection and patch repair: A case report
Xing RW, Nie HQ, Zhou XF, Zhang FF, Mou YH
- 1929** Concurrent ankylosing spondylitis and myelodysplastic syndrome: A case report
Xu GH, Lin J, Chen WQ

- 1937** Life-threatening subclavian artery bleeding following percutaneous coronary intervention with stent implantation: A case report and review of literature
Shi F, Zhang Y, Sun LX, Long S
- 1946** Cryptogenic organizing pneumonia associated with pregnancy: A case report
Lee YJ, Kim YS
- 1952** Eosinophilia complicated with venous thromboembolism: A case report
Su WQ, Fu YZ, Liu SY, Cao MJ, Xue YB, Suo FF, Liu WC
- 1961** Neck and mediastinal hematoma caused by a foreign body in the esophagus with diagnostic difficulties: A case report
Wang LP, Zhou ZY, Huang XP, Bai YJ, Shi HX, Sheng D
- 1966** Therapeutic endoscopy of a Dieulafoy lesion in a 10-year-old girl: A case report
Chen Y, Sun M, Teng X
- 1973** Cavernous hemangioma of an intrapancreatic accessory spleen mimicking a pancreatic tumor: A case report
Huang JY, Yang R, Li JW, Lu Q, Luo Y
- 1981** Surgery and antibiotics for the treatment of lupus nephritis with cerebral abscesses: A case report
Hu QD, Liao LS, Zhang Y, Zhang Q, Liu J
- 1991** Median arcuate ligamentum syndrome: Four case reports
Kim JE, Rhee PL
- 1998** Novel ABCB4 mutations in an infertile female with progressive familial intrahepatic cholestasis type 3: A case report
Liu TF, He JJ, Wang L, Zhang LY
- 2007** Primary duodenal dedifferentiated liposarcoma: A case report and literature review
Kim NI, Lee JS, Choi C, Nam JH, Choi YD, Kim HJ, Kim SS
- 2015** Implant site development using titanium plate and platelet-rich fibrin for congenitally missed maxillary lateral incisors: A case report
Zhang TS, Mudalal M, Ren SC, Zhou YM
- 2023** Successful embolization of an intrahepatic portosystemic shunt using balloon-occluded retrograde transvenous obliteration: A case report
Saito H, Murata S, Sugihara F, Ueda T, Yasui D, Miki I, Hayashi H, Kumita SI
- 2030** Bilateral pneumothorax and pneumomediastinum during colonoscopy in a patient with intestinal Behcet's disease: A case report
Mu T, Feng H
- 2036** Acute kidney injury due to intravenous detergent poisoning: A case report
Park S, Ryu HS, Lee JK, Park SS, Kwon SJ, Hwang WM, Yun SR, Park MH, Park Y

- 2045** Vaginal enterocele after cystectomy: A case report

Liu SH, Zhang YH, Niu HT, Tian DX, Qin F, Jiao W

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Navdeep Singh, MBBS, MS, Assistant Professor, Division of Transplantation, Department of Surgery, The Ohio State University, Columbus, OH 43210, United States.
navdeep.singh@osumc.edu

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The WJCC is now indexed in Science Citation Index Expanded (also known as SciSearch®), Journal Citation Reports/Science Edition, Scopus, PubMed, and PubMed Central. The 2021 Edition of Journal Citation Reports® cites the 2020 impact factor (IF) for WJCC as 1.337; IF without journal self cites: 1.301; 5-year IF: 1.742; Journal Citation Indicator: 0.33; Ranking: 119 among 169 journals in medicine, general and internal; and Quartile category: Q3. The WJCC's CiteScore for 2020 is 0.8 and Scopus CiteScore rank 2020: General Medicine is 493/793.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Ying-Yi Yuan*, Production Department Director: *Xu Guo*, Editorial Office Director: *Jin-Lei Wang*.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

February 26, 2022

COPYRIGHT

© 2022 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/gerinfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/gerinfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/gerinfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Efficacy of EGFR-TKI sequential therapy in patients with *EGFR* exon 19 insertion-positive non-small-cell lung cancer: A case report

Bin-Bin Shan, Yuan Li, Chang Zhao, Xiao-Qin An, Quan-Mao Zhang

Specialty type: Cell biology

Provenance and peer review:

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0

Grade B (Very good): 0

Grade C (Good): 0

Grade D (Fair): 0

Grade E (Poor): 0

P-Reviewer: Kermenli T

Received: August 5, 2021

Peer-review started: August 5, 2021

First decision: November 6, 2021

Revised: November 12, 2021

Accepted: January 11, 2022

Article in press: January 11, 2022

Published online: February 26, 2022



Bin-Bin Shan, Yuan Li, Chang Zhao, Xiao-Qin An, Department of Pneumology, Shanxi Tumor Hospital, Taiyuan 030000, Shanxi Province, China

Quan-Mao Zhang, Endoscopy Center, Shanxi Tumor Hospital, Taiyuan 030000, Shanxi Province, China

Corresponding author: Quan-Mao Zhang, BSc, Chief Physician, Endoscopy Center, Shanxi Tumor Hospital, No. 3 Zhigongxin Street, Xinghualing District, Taiyuan 030000, Shanxi Province, China. hdyunqi@yeah.net

Abstract

BACKGROUND

Insertions in exon 19 in the epidermal growth factor receptor gene (*EGFR*) is a rarely seen mutation in non-small cell lung cancer. These patients have been effectively treated with sequential *EGFR* tyrosine kinase inhibitors (TKIs).

CASE SUMMARY

Here, we presented a case of non-small cell lung cancer, stage IIIB, with *EGFR* exon 19 insertion mutation as detected in the right lower lobe by next-generation sequencing. The patient was sequentially treated with first, second, and third-generation *EGFR* TKIs after the surgical operation. The overall survival of the patient was 21.3 mo. There was no dynamic analysis of drug resistance mechanisms in targeted therapy.

CONCLUSION

This case emphasized the importance of following the guidelines. In patients with *EGFR* mutations, repeated and dynamic next-generation sequencing monitoring is necessary to prescribe a personalized treatment plan.

Key Words: Non-small cell lung cancer; Next-generation sequencing; *EGFR* exon 19 insertion; Afatinib; Case report

©The Author(s) 2022. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: We presented a case of non-small cell lung cancer carrying the rare *EGFR* exon 19 insertion mutation. The patient had a good and durable response to afatinib, which provided clinical evidence for the use of afatinib in these patients.

Citation: Shan BB, Li Y, Zhao C, An XQ, Zhang QM. Efficacy of EGFR-TKI sequential therapy in patients with *EGFR* exon 19 insertion-positive non-small-cell lung cancer: A case report. *World J Clin Cases* 2022; 10(6): 1883-1888

URL: <https://www.wjgnet.com/2307-8960/full/v10/i6/1883.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v10.i6.1883>

INTRODUCTION

The epidermal growth factor receptor (EGFR), a kind of receptor tyrosine kinase, plays critical roles in the initiation, promotion, and progression of malignant tumors by modulating downstream signaling pathways[1]. It has been documented that *EGFR* is overexpressed and mutated in several tumors, including non-small cell lung cancer (NSCLC)[2]. Apparently, *EGFR* serves as an important regulator of lung cancer growth, and overexpression of *EGFR* symbolizes the advancement of lung cancer, which is correlated with poor prognosis[3]. These characteristics suggest *EGFR* as a promising molecular target for tumor-specific therapy. *EGFR* mutations occur primarily in the EGFR tyrosine kinase (EGFR-TK) coding region, the target of EGFR tyrosine kinase inhibitors (TKIs)[4]. In NSCLC, especially lung adenocarcinoma, *EGFR* mutation is an important indicator for the use of EGFR TKIs. Therefore, the detection of *EGFR* mutation can facilitate the optimal use of these TKIs. The United States Food and Drug Administration has successively approved several EGFR TKIs as standard treatment regimens for NSCLC in first-line treatment. Different *EGFR* mutants showed different sensitivity to EGFR TKIs.

The most common *EGFR* mutations are short, in-frame deletions in exon 19 (usually 15 or 18 base pairs) and the exon 21 point mutation L858R and sensitive to the EGFR TKIs[5]. Other *EGFR* mutations are rare and respond differently to EGFR TKIs. Among these, *EGFR* exon 20 insertion mutation and T790M mutation are related to drug resistance. G719X, E709K, S768I are reported as moderate sensitive mutations[6]. The *EGFR* exon19 insertion mutation is also rare and accounts for only 0.11% of all lung cancer patients and 0.23% of *EGFR* mutation patients in the East Asian population[7]. Studies and case reports have shown that first-generation EGFR TKIs are effective in lung adenocarcinoma patients with *EGFR* exon 19 insertion. In contrast, second-generation afatinib has limited reports concerning this mutation[8].

Herein, we presented a NSCLC case carrying the rare *EGFR* exon 19 insertion mutation. The patient had a good and durable response to afatinib, which provides clinical evidence for the use of afatinib in these patients.

CASE PRESENTATION

Chief complaints

In this study, a 63-year-old Chinese male (45 pack year history) presented with chest pain for several days.

History of present illness

Patients a had history of chest pain.

History of past illness

Healthy.

Personal and family history

Patient had a long history of heavy smoking.

Physical examination

One month later, the patient underwent right lower lobectomy, right upper lobe wedge resection, and mediastinal lymphadenectomy under general anesthesia. Postoperative pathology suggested that patient had a T4N2M0 (stage IIIB) right lung adenocarcinoma with a positive surgical margin.

Laboratory examinations

Next-generation sequencing (NGS) was performed to identify the targeted mutations and identified an *EGFR* exon 19 insertion mutation.

Imaging examinations

Chest computed tomography (CT) revealed a ground-glass nodule in the right upper lobe (about 2 cm × 1.5 cm), a nodular soft tissue density (about 2.02 cm × 2.7 cm) in the right lower lobe, and the presence of multiple lymph nodes in mediastinal space (Figure 1).

FINAL DIAGNOSIS

After 1 mo, the patient received Gefitinib, a first-generation EGFR-TKI at a dose rate of 250 mg per day. Four months later, the patient visited again with chest and back pain. The patient underwent preoperative examination, and results showed no distant metastasis, as diagnosed by magnetic resonance imaging, abdominal ultrasound, and full-body bone scan. However, chest CT showed a postoperative change in the right lung. Meanwhile, bone scan showed multiple metastasis bone lesions of the sternum and the left seventh rib (Figure 1). The patient presented with recurrent postoperative metastasis with disease-free survival of 4 mo.

TREATMENT

Since the diagnosis of the recurrent metastasis, afatinib 30 mg p.o. daily was started to achieve the symptomatic control of the chest pain. After 8 mo, patient showed slow progression of the right upper lobe lesion (Figure 1). Due to the elevated tumor marker, carcinoembryonic antigen, a second NGS-based genetic testing of 73 cancer-related genes was performed on the patient's peripheral blood sample (Geneplus-Beijing Ltd., Beijing, China) to identify possible causes and potentially targeted mutations. The test revealed a somatic *EGFR* exon 19 insertion (NM_005228.3, c.2214_2231dupTAAAATTCCCGTCGCTAT, p.I740_K745dup) (Figure 2), which was identical to the mutation previously detected in the lung cancer samples. The NGS results suggest that afatinib was the best treatment to follow. Therefore, the patient continued to receive oral afatinib for 5 mo. Adverse reactions, such as skin rashes, nausea, vomiting, and diarrhea, were noted during the afatinib treatment course, which were treated symptomatically. Meanwhile, the patient reported the onset of acute sharp chest pain. Chest CT showed multiple bands in both lungs and a right pleural effusion (Figure 1). It is noteworthy that, initially, pleural effusion was slowly elevated without distinct clinical symptoms and pleural effusion puncture and drainage. After that, pleural effusion of the patient was augmented with chest depression, shortness of breath, and poor fluid quality, which was manifested as clinical progress. Later, the patient presented with dyspnea and cachexia, indicating clinical progression. The progression-free survival for the patient treated with afatinib was 13.4 mo. The patient, with no clinical improvement, was then switched to oral Osimertinib treatment, a third-generation EGFR-TKI. The three generations of drugs were taken orally instead of pleural effusion puncture and drainage.

OUTCOME AND FOLLOW-UP

The patient passed away after receiving 2 mo of treatment, with overall survival length of 21.3 mo.

DISCUSSION

The insertion mutation in exon 19 in *EGFR* gene is usually sensitive to targeted therapy[9]. Most patients with this mutation are females with adenocarcinoma who are non-smokers or light smokers. In patients with advanced NSCLC, first-generation EGFR TKIs are often used as the postoperative adjuvant or first-line treatment. The efficacy of TKIs fluctuates from 15.5%-24%[8]. A limited number of studies used the second-generation EGFR TKI, which achieved the best clinical results[9]. The case that we presented in this study is a male patient with a history of heavy smoking, who was treated with sequential EGFR-TKIs treatment. However, the efficacy of the first generation of TKI was only 30% and achieved 4 mo disease-free survival. The second-generation TKI afatinib treatment resulted in progression-free survival of 13.4 mo, which could be contributed to the fact that afatinib is a pan human epidermal growth factor receptor family inhibitor[9]. The last sequential use of Osimertinib treatment lasted 2 mo, and the overall survival was 21.3 mo. So far, this is the first time that Osimertinib was used to treat patient carrying *EGFR*19 insertion mutation. There are reports that the incidence of rare mutation T790M is low

July, 2018
Tumor tissue NGS
EGFR exon 19 insertion
p.V738delinsVKIPVAI

July, 2019
cfDNA NGS:
EGFR exon 19 insertion
p.1740_K745dup

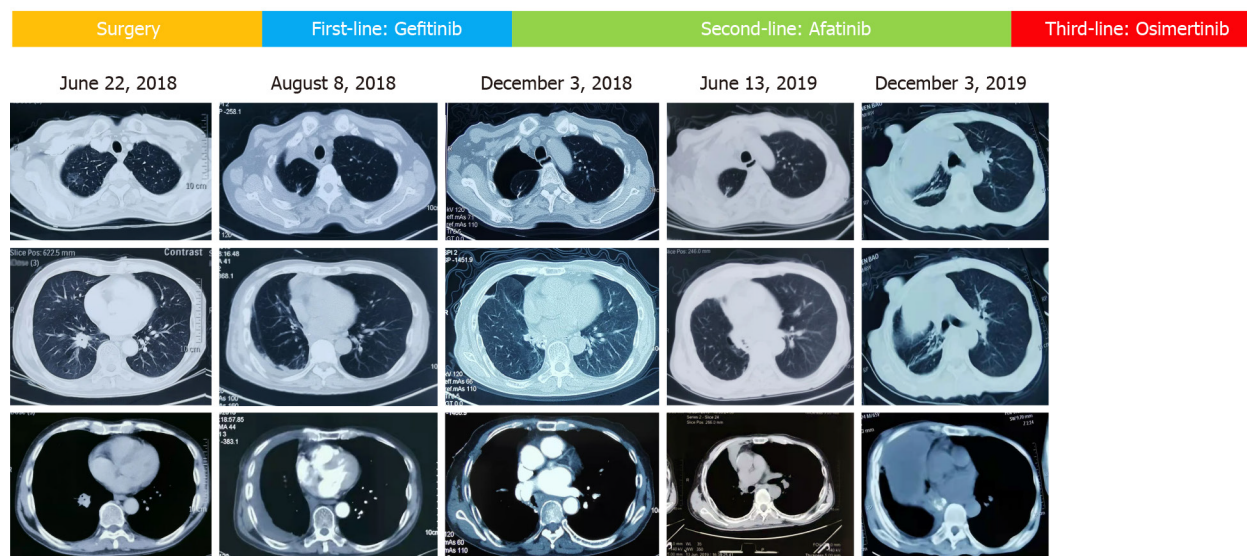


Figure 1 Treatment course of non-small cell lung cancer with sequential epidermal growth factor receptor tyrosine kinase inhibitor regimen with serial chest computed tomography scanning. June 22, 2018, a nodular density shadow in the lower lobe of the right lung, approximately 2.0 cm × 2.7 cm in size, and a ground-glass shadow in the upper right lung lobe, approximately 2 cm × 1.5 cm in size; August 8, 2018, postoperative changes and pleural effusion in the right lung; December 3, 2018, pleural effusion absorbed in the right lung after targeted therapy; June 13, 2019, encapsulated effusion in the right pleural cavity; December 3, 2019, encapsulated effusion increasing in the right pleural cavity. EGFR: Epidermal growth factor receptor; TKI: Tyrosine kinase inhibitor; cfDNA: cell free DNA; NGS: Next-generation sequencing.

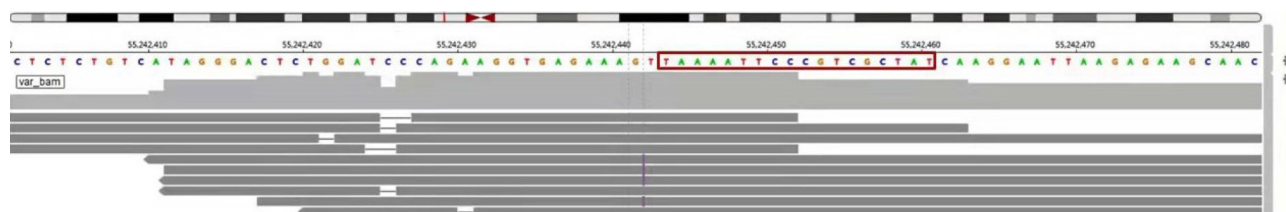


Figure 2 Next-generation sequencing showed *EGFR* exon 19 insertion.

after treatment with afatinib[10].

In the course of treatment, the surgical and peripheral blood samples were sent for second-generation sequencing to evaluate the mutations in 73 genes. The sequencing analysis to determine the mutations, including point mutations, small fragment insertions and/or deletions, copy number variations, and known fusion gene variations, are related to tumor occurrence and development. The results showed insertion mutation in exon 19 of *EGFR* gene. The nucleotide mutation was p.i740 K745dup, which results in the insertion of certain amino acids in the protein encoded by the *EGFR* gene. Previously, this mutation was not recorded in Catalogue of Somatic Mutations in Cancer and Memorial Sloan Kettering databases[11]. All patients with *EGFR* exon 19 insertion had amino acid change causing substitution of leucine at residue 747 by proline (L747P). The amino acid sequences of *EGFR* exon19 insertions reported in the literature include I740_P741insPVAIKI, I740_K745insIPVAIK, I744_K745insKIPVAI, K745_E746insIPVAIK, K745_E746insVPVAIK, and K745_E746insTPVAIK. Among these, the first four forms of mutation cause the same changes in the amino acid sequence. This amino acid change finally activates the tyrosine phosphorylation by binding with ligands. Autophosphorylation promotes downstream signal transduction pathways, including mitogen-activated protein kinase, phosphatidylinositol 3 kinase, and jun N-terminal kinase pathways, which induce cell proliferation and differentiation [12].

The patient reported in the current report had lesions in both right upper and lower lobes, as demonstrated on preoperative chest CT images, and there were ground-glass nodules in both lung lobes. The postoperative pathology of both nodules was adenocarcinoma. Mediastinal lymph nodes were positive. It is unclear whether they are both primary foci or one of them metastasized from the other. The earliest diagnostic criteria for multiple primary lung cancer (MPLC) was reported by Martini

[13], which focused on different tissue types. With the development of molecular pathology, the American Association of Chest Physicians revised the diagnostic criteria of MPLC. The new criteria classified the simultaneous multiple cancers located in different lobes without N2 and N3 lymph node infiltration and without systemic metastasis as MPLC. It also added molecular genetic characteristics. The histological subtype of lung adenocarcinoma is recommended to distinguish MPLC from lung metastasis[14]. There is literature showing that second-generation sequencing can be used to increase the diagnostic accuracy. There is a general consensus among several countries on the treatment of MPLC. However, the surgical treatment is considered as the first choice. Stella *et al*[15] suggested that surgical treatment should be performed no matter whether the multiple lesions are MPLC or pulmonary metastasis, as long as the lung function is acceptable and there is no lymph node metastasis.

CONCLUSION

In conclusion, we presented a case of lung adenocarcinoma with rare *EGFR* exon 19 insertion benefiting from afatinib therapy. This case provides unequivocal clinical evidence for the afatinib effectiveness in lung adenocarcinoma patients harboring *EGFR* exon 19 insertion and also provides evidence that these patients may benefit from EGFR TKIs sequential therapy. The treatment of this case is worth further discussing the importance of following the guidelines and initiating the standardized treatment. On the other hand, in the case of two nodules in different lobes, more molecular diagnosis is required to confirm the origin of the two nodules, which would be helpful for the selection of suitable drugs.

ACKNOWLEDGEMENTS

We acknowledge the contributions to this study from the patient and his family, the pathology department, and the radiology department.

FOOTNOTES

Author contributions: Shan BB, Zhang QM, and Li Y conceived and designed the study; Zhao C analyzed the data; An XQ contributed to literature review; Zhang QM wrote the manuscript and reviewed and edited the manuscript; Shan BB and Li Y contributed equally to this study; all authors read and approved the final manuscript.

Informed consent statement: Written informed consent was obtained from the patient for publication of the clinical data and any accompanying images. This is a retrospective case report and institutional approval was not needed.

Conflict-of-interest statement: The authors declare that they have no conflict of interest.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: China

ORCID number: Bin-Bin Shan 0000-0002-0968-7000; Yuan Li 0000-0001-5034-5419; Chang Zhao 0000-0003-0653-0742; Xiao-Qin An 0000-0001-5634-4601; Quan-Mao Zhang 0000-0003-0581-8349.

S-Editor: Liu JH

L-Editor: Filipodia

P-Editor: Liu JH

REFERENCES

- 1 de Marinis F, Laktionov KK, Poltoratskiy A, Egorova I, Hochmair M, Passaro A, Migliorino MR, Metro G, Gottfried M, Tsoi D, Ostoros G, Rizzato S, Mukhametshina GZ, Schumacher M, Novello S, Dziadziuszko R, Tang W, Clementi L, Cseh A, Kowalski D. Afatinib in EGFR TKI-naïve patients with locally advanced or metastatic EGFR mutation-positive non-

- small cell lung cancer: Interim analysis of a Phase 3b study. *Lung Cancer* 2021; **152**: 127-134 [PMID: [33387727](#) DOI: [10.1016/j.lungcan.2020.12.011](#)]
- 2 **Chen CY**, Yu ZY, Chuang YS, Huang RM, Wang TC. Sulforaphane attenuates EGFR signaling in NSCLC cells. *J Biomed Sci* 2015; **22**: 38 [PMID: [26036303](#) DOI: [10.1186/s12929-015-0139-x](#)]
- 3 **Zhen JJ**, Li SQ, Wen L, Lai MY, Cai LB. Cerebrospinal fluid carcinoembryonic antigen predict prognosis in leptomeningeal metastasis from non-small cell lung cancer. *Neuro-Oncology* 2019; **21**: 52 [DOI: [10.1093/neuonc/noz175.209](#)]
- 4 **Gelatti ACZ**, Drilon A, Santini FC. Optimizing the sequencing of tyrosine kinase inhibitors (TKIs) in epidermal growth factor receptor (EGFR) mutation-positive non-small cell lung cancer (NSCLC). *Lung Cancer* 2019; **137**: 113-122 [PMID: [31568888](#) DOI: [10.1016/j.lungcan.2019.09.017](#)]
- 5 **Hung MS**, Fang YH, Lin YC, Lung JH, Hsieh MJ, Tsai YH. Survival-associated factors of first-line EGFR-tyrosine kinase inhibitor responders and non-responders in lung adenocarcinoma patients with common *EGFR* mutations. *Mol Clin Oncol* 2018; **8**: 421-428 [PMID: [29456848](#) DOI: [10.3892/mco.2018.1550](#)]
- 6 **Jung HA**, Park S, Sun JM, Lee SH, Ahn JS, Ahn MJ, Park K. Treatment and Outcomes of Metastatic Non-Small-Cell Lung Cancer Harboring Uncommon *EGFR* Mutations: Are They Different from Those with Common *EGFR* Mutations? *Biology (Basel)* 2020; **9** [PMID: [33036377](#) DOI: [10.3390/biology9100326](#)]
- 7 **He M**, Capelletti M, Nafa K, Yun CH, Arcila ME, Miller VA, Ginsberg MS, Zhao B, Kris MG, Eck MJ, Jänne PA, Ladanyi M, Oxnard GR. EGFR exon 19 insertions: a new family of sensitizing EGFR mutations in lung adenocarcinoma. *Clin Cancer Res* 2012; **18**: 1790-1797 [PMID: [22190593](#) DOI: [10.1158/1078-0432.CCR-11-2361](#).]
- 8 **Lin YT**, Liu YN, Wu SG, Yang JC, Shih JY. Epidermal Growth Factor Receptor Tyrosine Kinase Inhibitor-sensitive Exon 19 Insertion and Exon 20 Insertion in Patients With Advanced Non-Small-cell Lung Cancer. *Clin Lung Cancer* 2017; **18**: 324-332.e1 [PMID: [28089594](#) DOI: [10.1016/j.clcc.2016.12.014](#).]
- 9 **Masood A**, Kancha RK, Subramanian J. Epidermal growth factor receptor (EGFR) tyrosine kinase inhibitors in non-small cell lung cancer harboring uncommon EGFR mutations: Focus on Afatinib. *Semin Oncol* 2019; **46**: 271-283 [PMID: [31558282](#) DOI: [10.1053/j.seminoncol.2019.08.004](#)]
- 10 **Yang S**, Mao S, Li X, Zhao C, Liu Q, Yu X, Wang Y, Liu Y, Pan Y, Wang C, Gao G, Li W, Xiong A, Chen B, Sun H, He Y, Wu F, Chen X, Su C, Ren S, Zhou C. Uncommon EGFR mutations associate with lower incidence of T790M mutation after EGFR-TKI treatment in patients with advanced NSCLC. *Lung Cancer* 2020; **139**: 133-139 [PMID: [31786475](#) DOI: [10.1016/j.lungcan.2019.11.018](#)]
- 11 **Su J**, Zhong W, Zhang X, Huang Y, Yan H, Yang J, Dong Z, Xie Z, Zhou Q, Huang X, Lu D, Yan W, Wu YL. Molecular characteristics and clinical outcomes of *EGFR* exon 19 indel subtypes to EGFR TKIs in NSCLC patients. *Oncotarget* 2017; **8**: 111246-111257 [PMID: [29340050](#) DOI: [10.18632/oncotarget.22768](#)]
- 12 **Xu J**, Jiang Q, Xu H, Liu A, Huang L. Two Patients Having NSCLC With Novel Duplication Mutation in Their EGFR Gene (p.I740_K745dupIPVAIK) and Their Response to Osimertinib. *J Thorac Oncol* 2020; **15**: e49-e51 [PMID: [32216945](#) DOI: [10.1016/j.jtho.2019.11.026](#)]
- 13 **Martini N**, Melamed MR. Multiple primary lung cancers. *J Thorac Cardiovasc Surg* 1975; **70**: 606-612 [PMID: [170482](#)]
- 14 **Kozower BD**, Lerner JM, Detterbeck FC, Jones DR. Special treatment issues in non-small cell lung cancer: Diagnosis and management of lung cancer, 3rd ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest* 2013; **143**: e369S-e399S [PMID: [23649447](#) DOI: [10.1378/chest.12-2362](#)]
- 15 **Stella F**, Luciano G, Dell'Amore A, Greco D, Ammari C, Giunta D, Bini A. Pulmonary Metastases from NSCLC and MPLC (Multiple Primary Lung Cancers): Management and Outcome in a Single Centre Experience. *Heart Lung Circ* 2016; **25**: 191-195 [PMID: [26525847](#) DOI: [10.1016/j.hlc.2015.07.016](#)]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

