Respiratory Medicine Case Reports 24 (2018) 32–34

Contents lists available at ScienceDirect

Respiratory Medicine Case Reports

journal homepage: www.elsevier.com/locate/rmcr

Case report

Lung cancer induced from chemotherapy a 20 years old case

Konstantinos Sapalidis[a], Stella Laskou[a], Aikaterini Amaniti[b], Stylianos Mantalovas[a], Dimitris Giannakidis[a], Charilaos Koulouris[a], Ilias Karapantzos[c], Chrysa Karapantzou[c], Konstantina Mponiou[d], Theodora Tsiouda[e], Fotis Konstantinou[f], Ioanna Kougioumtzi[g], Nikos Katsikogiannis[g], Chrysa Sardeli[h], Apostolos Gogakos[i], Nikos Schizas[i], Philip Domeyer[j], Paul Zarogoulidis[e,*], Isaak Kesisoglou[a]

[a] 3rd Department of Surgery, "AHEPA" University Hospital, Aristotle University of Thessaloniki, Medical School, Thessaloniki, Greece
[b] Anesthesiology Department, "AHEPA" University General Hospital, Aristotle University of Thessaloniki, Thessaloniki, Greece
[c] Ear, Nose and Throat Department, "Saint Luke" Private Hospital, Thessaloniki, Panorama, Greece
[d] Radiotherapy Department-Oncology Unit, "Theageneio" Cancer Hospital, Thessaloniki, Greece
[e] Pulmonary Department-Oncology Unit, "Theageneio" Cancer Hospital, Thessaloniki, Greece
[f] Thoracic Surgery Department, University General Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
[g] Surgery Department (NHS), University General Hospital of Alexandroupolis, Democritus University of Thrace, Alexandroupolis, Greece
[h] Department of Pharmacology & Clinical Pharmacology, School of Medicine, Faculty of Health Sciences, Aristotle University of Thessaloniki, Thessaloniki, Greece
[i] Thoracic Surgery Department (NHS), "Theageneio" Cancer Hospital, Thessaloniki, Greece
[j] Hellenic Open University, Cyprus

ARTICLE INFO

Keywords:
Hodgkin lymphoma
Laryngeal cancer
Lung cancer
Radiation
EBUS

ABSTRACT

Lung cancer is diagnosed at a late stage although we have novel diagnostic tools. The association of smoking and other environmental factors are well known. However; there are cases where a malignancy is associated with previous radiation treatment. There is an association between radiotherapy treatment and cancer incidence. We present a case where lung cancer and laryngeal cancer was induced 20 years after radiation therapy of a hogkin lymphoma.

1. Introduction

We have recent advances in the diagnosis and treatment of lung cancer with novel instruments and therapies. The convex-probe endobronchial ultrasound and the radial endobronchial ultrasound (EBUS) brought a revolution to the diagnosis of lung cancer, however; they are not tools that can be used in every pulmonary department [1–3]. On the other hand we have novel therapies for non-small cell lung cancer (NSCLC) such as; immunotherapy (nivolumab and pembrolizumab) and targeted therapies with tyrosine kinase inhibitors (TKIs) for epidermal growth factor receptor (EGFR), anaplastic lymphoma kinase (ALK), murine sarcoma viral oncogene homolog B (BRAF) and proto-oncogene tyrosine-protein kinase (ROS-1) [4]. Radiotherapy can be used either as a primary therapy for NSCLC or palliative care [5]. In any case the medical history of the patient might reveal co-occurrence of multiple primary cancers. There is also the case where radiotherapy or chemotherapy pretreatment induced another type of cancer [6]. In the current case we will present a patient diagnosed with Hodgkin lymphoma in 1997 and presented in situ laryngeal cancer after 15 years and lung cancer after 20 years. Occurrence of a cancer after radiotherapy treatment has been previously reported and the association of radiotherapy treatment and cancer has been established [7].

2. Case presentation

A 57 year old patient (age today) was diagnosed with Hodgkin lymphoma in 1997 from a tracheal lymph-node. Smoking history when diagnosed with Hodgkin lymphoma with 15 p/y. He received in total 3000 rad of radiotherapy as primary therapy. The disease was stable until 2010 were the patient presented in the outpatient cabinet with enlarged lymph-nodes in the whole body. Again a biopsy from a tracheal lymph node revealed Hodgkin disease relapse. He received 6 cycles of Andriamycin 45mg Bleomycin 670mg Viblastine 10mg Detisene 680mg for 6 months. A positron emission tomography 3 months after the last chemotherapy was negative for active disease. The

* Corresponding author.
E-mail address: pzarog@hotmail.com (P. Zarogoulidis).

https://doi.org/10.1016/j.rmcr.2018.03.013
Received 19 March 2018; Received in revised form 21 March 2018; Accepted 25 March 2018

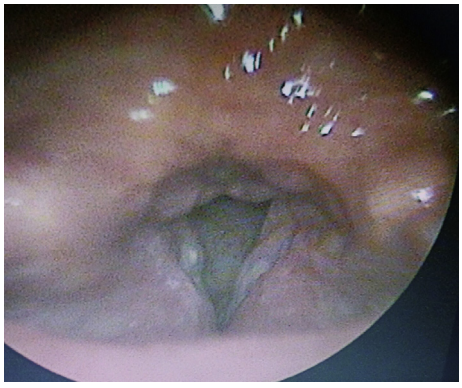

Fig. 1. Figure from microlaryngoscopy.

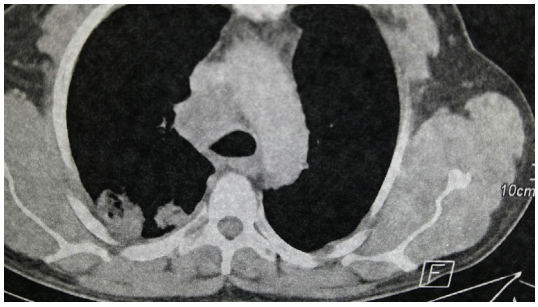

Fig. 2. CT of the thorax.

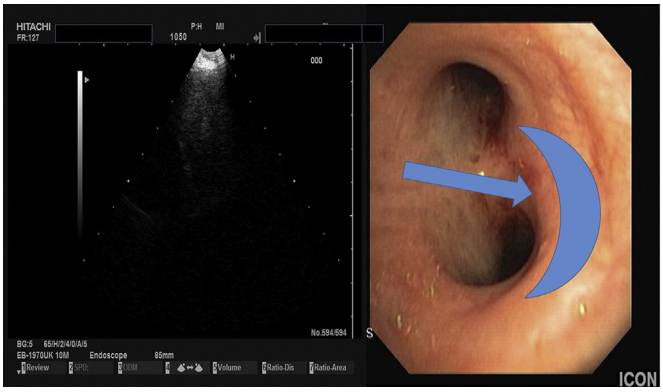

Fig. 3. Endoscopy with convex probe endobronchial ultrasound (EBUS) blue arrow indicating the block of lymph-nodes.

patient remained under observation as an outpatient for 4 years without disease relapse. However; early in 2016 he presented in the outpatient cabinet with hemoptysis and a in situ laryngeal cancer was diagnosed (Fig. 1). He received 6000 rad as radiotherapy treatment and platinum analog for six cycles carboplatin AUC 600mg. The patient remained under observation. In 2017 a CT thorax revealed a mass in the right lower lobe and enlarged mesothorax lymph-nodes positive with PET-CT (Fig. 2). Biopsy of the lymph-nodes with a convex probe endobronchial ultrasound revealed adenocarcinoma with EGFR and ALK negative expression(Fig. 3). He received 6 cycles of carboplatin AUC 600 and pemetrexed 1000mg. He was disease free for 4 months until a new staging with PET-CT revealed disease relapse and 4 cycles of carboplatin AUC 600 and taxane 370 derivative was administered. A further investigation in the first biopsy for BRAF, ROS-1 and PD-L1 expression revealed negative expression.

3. Discussion

It is known from the epidemiological study of survivors of atomic bomb irradiation [8,9] and it has been suggested and observed in clinical practice that irradiation of surrounding tissues can cause second cancers [10,11]. The benefits of radiotherapy outweigh the risks of developing subsequent cancers, therefore methods of minimizing the radiation dose delivered to surrounding tissues or the volume should be further investigated. However; there also other factors contributing to carcinogenesis like; environmental exposure to carcinogens, genetic predisposition, misdiagnosis of metastases as primary cancers, reproductive factors. Therefore increased medical surveillance should follow the first cancer for treatment-related effects. It has been observed that genetic and environmental predisposition may increase the incidence of a second cancer, while treatment related tumors are expected to develop some time after an iatrogenic effect. Previous clinical observations indicate that second cancers after an exposure to radiation would develop within a time window of 5 years for leukemia and 10 years for solid tumors [12–17]. Previously it has been suggested that a certain latency period passes before a new tumor appears. There is a clear association between latency time and cancer type. Moreover; chemotherapy can induce second cancer development [18]. An excess incidence of acute myeloid leukemia and myelodysplastic syndrome has been associated with therapy in those patients who received doxorubicin when compared with those who received doxorubicin combined with cyclophosphamide therapy [16]. The incidence was higher in those patients that received intensified cyclophosphamide doses (requiring granulocyte colony-stimulating factor support). An excess incidence of lung cancer has been observed at 10 years or more after radiotherapy, in several studies [17,19]. In our case we have an association of radiotherapy, chemotherapy and secondary factors which we believe were smoking history and genetic predisposition. The patient is under close follow-up to date.

Disclosure

The authors declare no conflict of interest.

References

[1] P. Zarogoulidis, H. Huang, C. Bai, C. Kosmidis, G. Trakada, L. Veletza, T. Tsiouda, N. Barbetakis, D. Paliouras, E. Athanasiou, D. Hatzibougias, A. Kallianos, N. Panagiotopoulos, L. Papaemmanouil, W. Hohenforst-Schmidt, Endobronchial ultrasound convex probe for lymphoma, sarcoidosis, lung cancer and other thoracic entities. A case series, Res. Med. Case Rep. 22 (2017) 187–196.

[2] H. Haidong, N. Yunye, Z. Wei, P. Zarogoulidis, W. Hohenforst-Schmidt, Y.G. Man, Y. Yuguang, D. Yuchao, B. Chong, Multiple guided technologies based on radial probe endobronchial ultrasound for the diagnosis of solitary peripheral pulmonary lesions: a single-center study, J. Cancer 8 (17) (2017) 3514–3521.

[3] W. Hohenforst-Schmidt, P. Zarogoulidis, G. Pitsiou, B. Linsmeier, D. Tsavlis, I. Kioumis, E. Papadaki, L. Freitag, T. Tsiouda, J.F. Turner, R. Browning, M. Simoff, N. Sachpekidis, K. Tsakiridis, B. Zaric, L. Yarmus, S. Baka, G. Stratakos, H. Rittger, Drug eluting stents for malignant airway obstruction: a critical review of the literature, J. Cancer 7 (4) (2016) 377–390.

[4] I. Moya-Horno, S. Viteri, N. Karachaliou, R. Rosell, Combination of immunotherapy with targeted therapies in advanced non-small cell lung cancer (NSCLC), Ther. Adv Med. Oncol. 10 (2018) 1758834017745012.

[5] M. Christodoulou, N. Bayman, P. McCloskey, C. Rowbottom, C. Faivre-Finn, New radiotherapy approaches in locally advanced non-small cell lung cancer, Eur. J. Cancer 50 (3) (2014) 525–534.

[6] R. Roychoudhuri, H. Evans, D. Robinson, H. Moller, Radiation-induced malignancies following radiotherapy for breast cancer, Br J. Cancer 91 (5) (2004) 868–872.

[7] D.C. Weber, S. Johanson, N. Peguret, L. Cozzi, D.R. Olsen, Predicted risk of radiation-induced cancers after involved field and involved node radiotherapy with or without intensity modulation for early-stage hodgkin lymphoma in female patients, Int. J. Radiat. Oncol. Biol. Phys. 81 (2) (2011) 490–497.

[8] C.E. Land, M. Tokunaga, K. Koyama, M. Soda, D.L. Preston, I. Nishimori, S. Tokuoka, Incidence of female breast cancer among atomic bomb survivors, Hiroshima and Nagasaki, 1950-1990, Radiat. Res. 160 (6) (2003) 707–717.

[9] D.L. Preston, Y. Shimizu, D.A. Pierce, A. Suyama, K. Mabuchi, Studies of mortality of atomic bomb survivors, Report 13: Solid cancer and noncancer disease mortality: 1950-1997, Radiat. Res. 160 (4) (2003) 381–407.

[10] A.I. Neugut, M.D. Weinberg, H. Ahsan, J. Rescigno, Carcinogenic effects of radiotherapy for breast cancer, Oncology 13 (9) (1999) 1245–1256 discussion 1257, 1261-5.
[11] E.B. Harvey, L.A. Brinton, Second cancer following cancer of the breast in Connecticut, 1935-82, Natl. Canc. Inst. Monogr. 68 (1985) 99–112.
[12] J.D. Boice Jr., N.E. Day, A. Andersen, L.A. Brinton, R. Brown, N.W. Choi, E.A. Clarke, M.P. Coleman, R.E. Curtis, J.T. Flannery, et al., Second cancers following radiation treatment for cervical cancer. An international collaboration among cancer registries, J Nat. Cancer Ins. 74 (5) (1985) 955–975.
[13] C.E. Land, J.D. Boice Jr., R.E. Shore, J.E. Norman, M. Tokunaga, Breast cancer risk from low-dose exposures to ionizing radiation: results of parallel analysis of three exposed populations of women, J Nat. Cancer Ins. 65 (2) (1980) 353–376.
[14] A.I. Neugut, E. Robinson, W.C. Lee, T. Murray, K. Karwoski, G.J. Kutcher, Lung cancer after radiation therapy for breast cancer, Cancer 71 (10) (1993) 3054–3057.
[15] C. Rubino, F. de Vathaire, A. Shamsaldin, M. Labbe, M.G. Le, Radiation dose, chemotherapy, hormonal treatment and risk of second cancer after breast cancer treatment, Br. J. Cancer 89 (5) (2003) 840–846.
[16] R.E. Smith, J. Bryant, A. DeCillis, S. Anderson, B. National Surgical Adjuvant, E. Bowel Project, Acute myeloid leukemia and myelodysplastic syndrome after doxorubicin-cyclophosphamide adjuvant therapy for operable breast cancer: the National Surgical Adjuvant Breast and Bowel Project Experience, J. Clin. Oncol. Off. J. Am. Soc. Clin. Oncol. 21 (7) (2003) 1195–1204.
[17] L.B. Zablotska, A.I. Neugut, Lung carcinoma after radiation therapy in women treated with lumpectomy or mastectomy for primary breast carcinoma, Cancer 97 (6) (2003) 1404–1411.
[18] T. Vega-Stromberg, Chemotherapy-induced secondary malignancies, J. Infus. Nurs. Off. Pub Infus. Nurses Soc. 26 (6) (2003) 353–361.
[19] M. Deutsch, S.R. Land, M. Begovic, H.S. Wieand, N. Wolmark, B. Fisher, The incidence of lung carcinoma after surgery for breast carcinoma with and without postoperative radiotherapy. Results of National Surgical Adjuvant Breast and Bowel Project (NSABP) clinical trials B-04 and B-06, Cancer 98 (7) (2003) 1362–1368.