

# Modern radiopharmaceuticals for lung cancer imaging with positron emission tomography/computed tomography scan: A systematic review

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## Abstract

**Introduction:** In this study, we evaluated the use and the contribution of radiopharmaceuticals to the field of lung neoplasms imaging using positron emission tomography/computed tomography.

**Methods:** We conducted review of the current literature at PubMed/MEDLINE until February 2020. The search language was English.

**Results:** The most widely used radiopharmaceuticals are the following:

Experimental/pre-clinical approaches: (18)F-Misonidazole (18F-MISO) under clinical development, D(18)F-Fluoro-Methyl-Tyrosine (18F-FMT), 18F-FAMT (L-[3-18F] (18)F-Fluorothymidine (18F-FLT)), (18)F-Fluoro-Azomycin-Arabinoside (18F-FAZA), (68)Ga-Neomannosylated-Human-Serum-Albumin (68Ga-MSA) (23), (68)Ga-Tetraazacyclododecane (68Ga-DOTA) (as theranostic agent), (11)C-Methionine (11C-MET), 18F-FPDOPA,  $\alpha\text{v}\beta_3$  integrin, <sup>68</sup>Ga-RGD<sub>2</sub>, <sup>64</sup>Cu-DOTA-RGD, <sup>18</sup>F-Alfatide, Folate Radio tracers, and immuno-positron emission tomography radiopharmaceutical agents.

Clinically approved procedures/radiopharmaceuticals agents: (18)F-Fluoro-Deoxy-Glucose (18F-FDG), (18)F-sodium fluoride (18F-NaF) (bone metastases), and (68)Ga-Tetraazacyclododecane (68Ga-DOTA). The quantitative determination and the change in radiopharmaceutical uptake parameters such as standard uptake value, metabolic tumor volume, total lesion glycolysis, FAZA tumor to muscle ratio, standard uptake value tumor to liver ratio, standard uptake value tumor to spleen ratio, standard uptake value maximum ratio, and the degree of hypoxia have prognostic and predictive (concerning the therapeutic outcome) value. They have been associated with the assessment of overall survival and disease free survival. With the positron emission tomography/computed tomography radiopharmaceuticals, the sensitivity and the specificity of the method have increased.

**Conclusion:** In terms of lung cancer, positron emission tomography/computed tomography may have clinical application and utility (a) in personalizing treatment, (b) as a biomarker for the estimation of overall survival, disease free survival, and (c) apply a cost-effective patient approach because it reveals focuses of the disease, which are not found with the other imaging methods.

## Keywords

Positron emission tomography/computed tomography, lung cancer, radiopharmaceuticals

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## Introduction

Lung cancer is one of the world's most common and aggressive neoplasms. For this reason, it is important to have a timely diagnosis and then a proper treatment and follow-up. Positron emission tomography/computed tomography (PET/CT) is a useful tool for detecting, staging, taking therapeutic decisions, and assessing response to treatment (chemotherapy, radiotherapy, immunotherapy, etc.). Because of (lung cancer) high death rates and deficiency in investigation, pre-clinical and clinical introduction of novel radiopharmaceuticals in PET/CT domain is vital.<sup>1</sup> The approval of more new

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