

# Management of incidental findings on [<sup>18</sup>F]FDG PET/CT

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## Clinical relevance

Incidental findings are a relevant part of routine clinical practice in reporting [<sup>18</sup>F]FDG PET/CT investigations. Knowledge and structured approach to these lesions is therefore essential. According to the Incidental Findings Committee of the American College of Radiology (ACR) ‘An incidental finding is an incidentally discovered mass or lesion, detected by an imaging modality performed for an unrelated reason (1). As it is formulated in the aims and goals of the Incidental Findings Committee: risk of patients from additional imaging (radiation burden) and interventional procedures and costs created by incidental findings should be minimised (1). Incidental findings in general can cause delay in starting treatment, as confirmation or ruling out malignancy in suspicious incidental findings take time. If biopsy is indicated, first it needs to be scheduled and the histopathological investigation takes time as well. In the meantime, tumor spread can evolve, requiring more invasive treatment which may lead to an increase in mortality (2). In patients with a malignant head or neck squamous cell carcinoma for example, the hazard risk of mortality was increased 2,5 times when an incidental finding was reported (2). Therefore, a timely start and a minimised time-window of the diagnostic process in case of incidental findings should be pursued (2). The incidence of incidental findings is different in a healthy population, in a population where [<sup>18</sup>F]FDG PET/CT is performed for a benign indication such as endocarditis, sarcoidosis or

vasculitis and in patients with a known malignancy. With the current priority in reducing mortality due to cancer, screening is becoming more and more implemented (3). In China and Japan, screening studies in healthy populations showed malignant incidental findings in 0.7% up to 3.16% (4-6). Sensitivity appeared to be high (84-91%) in malignancies with high [<sup>18</sup>F]FDG uptake, such as lung, colon, rectum, thyroid and [<sup>18</sup>F]FDG positive breast malignancies. In detection of malignancies of the kidneys, prostate, bladder and stomach the sensitivity was low due to less intense or no [<sup>18</sup>F]FDG uptake (4-6). In patients where [<sup>18</sup>F]FDG PET/CT is performed for a benign indication, such as sarcoidosis or tuberculosis, incidental malignant findings detection rate was 4%. In case of suspected infectious endocarditis it was 7.5% (7,8). In patients with a known primary malignancy, where imaging is performed for staging or follow up, relevant incidental findings are reported from 1.2% up to 17%, dependent on the type of primary tumor (9-11). In patients suspected for

lung cancer, in 1.2% and 3% malignant and premalignant incidental findings were found (9). In case of head and neck tumors, incidentally lung cancer was found in 5% of the patients, mostly squamous cell carcinoma (9). In patients with oesophageal cancer, 17% had multiple single type tumors, 15.5% had two types of tumors and 1.5% had three types of tumors, with second and third primary tumors mostly located in the stomach, head and neck and colon (11). In case of [<sup>18</sup>F]FDG PET/CT investigations, incidental findings can be appreciated on the PET images, on the low dose or high dose CT images or both. Incidental findings can be visible or not visible on CT images and can change their appearance according to the phase of i.v. contrast enhancement (figure 1). Therefore it is essential to carefully and systematically study all parts of the PET/CT imaging, preferably starting with the CT investigation to prevent bias of the increased [<sup>18</sup>F]FDG uptake and satisfaction of search error (12). Previous imaging should be reviewed as well when available.

Based on our clinical practice and the literature, the following considerations

	[ <sup>18</sup> F]FDG positive	[ <sup>18</sup> F]FDG negative
CT abnormality	X	X
CT normal	X	☹

Figure 1. Incidental [<sup>18</sup>F]FDG PET/CT findings classified according to visualisation on PET, CT or both.

Preparation	Reporting
Get to know your patient	Is it disease related?
Knowledge of disease	Is it something else?
Knowledge of incidental findings	Malignant / Benign?
Not every cancer is [ <sup>18</sup> F]FDG positive and not every [ <sup>18</sup> F]FDG positive lesion is cancer	Artifact / Misalignment ?

Figure 2. Relevant factors for optimal interpretation and management of incidental findings on [<sup>18</sup>F]FDG PET/CT

should be taken into account when incidental findings are seen on an [<sup>18</sup>F]FDG PET/CT investigation (figure 2).

The clinical integrative approach was assessed in a study with 1727 patients, in which the question was how oncologists deal with incidental increased [<sup>18</sup>F]FDG uptake on [<sup>18</sup>F]FDG PET/CT scans combined with low dose CT (13). Definition of incidental finding was a focal non-thyroidal [<sup>18</sup>F]FDG uptake considered unrelated to the evaluated malignancy by the reporting clinician. In 12% of the cases incidental findings were reported and 8% of those was proven to be malignant, which meant an incidental non-thyroidal cancer rate of 0.9%. The referring oncologist ordered active investigation in only 58% of these cases after placing the imaging finding in the clinical context. Interestingly, however not all incidental findings were confirmed, the incidence of secondary malignancy in the studied population was comparable to previous reports. This suggests that placing the incidental finding in the clinical context can aid the decision whether additional investigation should be performed. It has been shown that knowledge of the clinical information improves the radiology report and reporting time was not substantially increased by adding clinical information (14). It is very likely that knowledge of imaging and pathophysiological features of the

disease e.g. usual pattern of metastatic spread improves the quality of reporting as well, including incidental findings. Discussing the patient in a multidisciplinary tumor board aids interpretation of the imaging abnormalities as well (15).

Next to continuing education, reference papers and teaching websites can assist in gaining specific knowledge on incidental findings. In particular the paper of Pencharz et al. (16) and The Radiology Assistant on the Educational site of the Radiological Society of the Netherlands (17) are two excellent and concise sources.

In conclusion, incidental findings are relevant in reporting [<sup>18</sup>F]FDG PET/CT investigations. Timely and accurate recognition of these lesions is essential as it prevents treatment delay, it can reduce mortality and increase workflow efficiency. Next to clinical background, knowledge of the pathophysiology and the most common incidental findings, [<sup>18</sup>F]FDG positive and negative features and artefacts, adequate support lines such as papers and online sources such as teaching websites are recommended. Peer experience is also an essential source to gain more knowledge on incidental findings, so do not hesitate to ask your colleagues when in doubt about an (incidental) finding. Discussing the patient at a multidisciplinary tumor board aids

interpretation of incidental findings as well.

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## References

1. ACR. Incidental Findings Committee Accessed 25-2-2023, 2023. <https://www.acr.org/Clinical-Resources/Incidental-Findings>
2. Schoonbeek RC, Bult FFS, Plaat BEC, et al. Incidental findings during the diagnostic work-up in the head and neck cancer pathway: Effects on treatment delay and survival. *Oral Oncol.* 2021;118:105350. doi:10.1016/j.oraloncology.2021.105350
3. Sengoku T, Matsumura K, Usami M, Takahashi Y, Nakayama T. Diagnostic accuracy of FDG-PET cancer screening in asymptomatic individuals: use of record linkage from the Osaka Cancer Registry. *Int J Clin Oncol.* 2014;19:989-97. doi:10.1007/s10147-014-0666-6
4. Minamimoto R, Senda M, Jinnouchi S, et al. The current status of an FDG-PET cancer screening program in Japan, based on a 4-year (2006-2009) nationwide survey. *Ann Nucl Med.* 2013;27:46-57. doi:10.1007/s12149-012-0660-x
5. Anzai Y, Nishizawa S, Shinke T, Takesono S, Asai T, Okada H. Prospective Employer-Initiated Whole-Body Cancer Screening- Costs and Outcomes of a Cancer Screening Program in Japan. *J Am Coll Radiol.* 2021;18:140-147. doi:10.1016/j.jacr.2020.09.065
6. Ide M. Cancer screening with FDG-PET. *Q J Nucl Med Mol Imaging.* 2006;50:23-7
7. Huber H, Hodolic M, Stelzmuller I, et al. Malignant disease as an incidental finding at 18F-FDG-PET/CT scanning in patients with granulomatous lung disease. *Nucl Med Commun.* 2015;36:430-7. doi:10.1097/

- MNM.0000000000000274
8. Gouriet F, Tissot-Dupont H, Casalta JP, et al. FDG-PET/CT Incidental Detection of Cancer in Patients Investigated for Infective Endocarditis. *Front Med (Lausanne)*. 2020;7:535. doi:10.3389/fmed.2020.00535
  9. Chopra A, Ford A, De Noronha R, Matthews S. Incidental findings on positron emission tomography/CT scans performed in the investigation of lung cancer. *Br J Radiol*. 2012;85:e229-37. doi:10.1259/bjr/60606623
  10. Atabek U, Mohit-Tabatabai MA, Raina S, Rush BF, Jr., Dasmahapatra KS. Lung cancer in patients with head and neck cancer. Incidence and long-term survival. *Am J Surg*. 1987;154:434-8. doi:10.1016/0002-9610(89)90019-6
  11. Miyazaki T, Sohda M, Higuchi T, et al. Effectiveness of FDG-PET in screening of synchronous cancer of other organs in patients with esophageal cancer. *Anticancer Res*. 2014;34:283-7
  12. Berbaum KS, Franken EA, Jr., Dorfman DD, et al. Satisfaction of search in diagnostic radiology. *Invest Radiol*. 1990;25:133-40. doi:10.1097/00004424-199002000-00006
  13. Wang G, Lau EW, Shakher R, et al. How do oncologists deal with incidental abnormalities on whole-body fluorine-18 fluorodeoxyglucose PET/CT? *Cancer*. 2007;109:117-24. doi:10.1002/cncr.22370
  14. Castillo C, Steffens T, Sim L, Caffery L. The effect of clinical information on radiology reporting: A systematic review. *J Med Radiat Sci*. 2021;68:60-74. doi:10.1002/jmrs.424
  15. Lesslie M, Parikh JR. Implementing a Multidisciplinary Tumor Board in the Community Practice Setting. *Diagnostics (Basel)*. 2017;7doi:10.3390/diagnostics7040055
  16. Pencharz D, Nathan M, Wagner TL. Evidence-based management of incidental focal uptake of fluorodeoxyglucose on PET-CT. *Br J Radiol. Apr* 2018;91(1084):20170774. doi:10.1259/bjr.20170774
  17. Radiological Society of the Netherlands Accessed 25-2-2023, 2023. <https://radiologyassistant.nl/>