FDITE223 Clinical use of different PET radiopharmaceuticals

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Description:

During the course students will acquire comprehensive knowledge about PET radiopharmaceuticals used in clinical practice and their applications in oncology, neurology and other clinical fields. The uptake mechanisms, indications, diagnostic value and limitations of various tracers will be presented, with special focus on molecular imaging possibilities beyond FDG.

Topics:

Clinical applications of various PET radiopharmaceuticals

Basic principles of PET imaging and radiopharmaceutical development

- Physical basis of PET technology
- General aspects of radiopharmaceutical design

F-18 FDG: the most commonly used PET tracer

- Glucose metabolism and FDG uptake mechanism
- Oncological applications: staging, restaging, therapeutic response
- Limitations and pitfalls (inflammation, physiological uptake)

F-18 FDG applications in various tumor types

- Lung, lymphoma, colorectal, breast cancers
- Head and neck tumors and melanoma
- FDG-negative tumors and the need for alternative tracers

Ga-68/F-18 PSMA: prostate-specific membrane antigen imaging

- PSMA expression and its significance in prostate cancer
- Primary staging and biochemical recurrence detection
- PSMA-based theranostics: from diagnostics to therapy

F-18 DOPA: dopamine precursor applications

- Dopamine synthesis and DOPA uptake

- Diagnostics of Parkinson's disease and movement disorders
- Imaging of neuroendocrine tumors
- Primary and secunder brain tumors

F-18 FET: fluoroethyl-tyrosine in brain tumor diagnostics

- Amino acid transport mechanism
- Differential diagnosis and grading of gliomas
- Radiotherapy planning and recurrence detection

C-11 Methionine and other amino acid tracers

- Protein synthesis imaging
- Brain tumors and other applications
- C-11 vs. F-18 labeled amino acids

F-18/C-11 Choline: cell membrane synthesis imaging

- Choline metabolism in tumor cells
- Diagnostics of prostate and liver tumors
- Choline vs. PSMA in prostate cancer imaging

Ga-68 DOTATATE/DOTATOC: somatostatin receptor imaging

- Somatostatin receptor expression
- Diagnostics of neuroendocrine tumors
- Preparation for peptide receptor radionuclide therapy (PRRT)

F-18 NaF: sodium fluoride bone scintigraphy

- Bone metabolism and fluoride incorporation
- Detection of bone metastases
- NaF PET/CT vs. conventional bone scintigraphy

F-18 FES: estrogen receptor imaging

- Assessment of estrogen receptor expression
- In vivo determination of breast cancer hormone receptor status
- Prediction of endocrine therapy efficacy

Ga-68 FAPI: fibroblast activation protein imaging

- FAP expression in tumor stroma
- Imaging of various tumor types
- FAPI vs. FDG: advantages and disadvantages

Hypoxia tracers (F-18 FMISO, F-18 FAZA)

- Significance of tumor hypoxia
- Methods of hypoxia imaging
- Radiotherapy and chemotherapy planning

Proliferation tracers (F-18 FLT)

- Thymidine analogs and DNA synthesis
- Measurement of proliferation in tumors
- FLT vs. FDG: when to use which

Experimental and developing radiopharmaceuticals

- Immuno-PET: zirconium-89 labeled antibodies
- CXCR4, HER2, and other receptor tracers
- Development of theranostic pairs

Literature:

H-J. Biersack, L.M. Freeman (eds.): Clinical Nuclear Medicine, Springer-Verlag 2007, ISBN 978-3-540-28025-5

R. Hustinx, K Muylle (eds.): European Nuclear Medicine Guide, EANM, ISBN 978-90-78876-13-7

C. Aktolm, S.J. Goldsmith: Nuclear Oncology, Lippincott Williams&Wilkins, 2014, ISBN 978-1451186857