

Assessment of radiation dosimetry base on obtained bio-distribution from PET/CT imaging using ^{68}Ga -FAPI in cancer patients

Shahram Parvizi

Ph.D. Candidate in Biophysics

Institute of Biochemistry and Biophysics .Tehran University

Email:parvizi@ut.ac.ir

Introduction

- PET/CT is a multy modality system used in Medical Imaging .It uses a CT scanner and PET scanner to provide anatomy physiology and pathology .
- Injection of a Radiopharmaceutical which is a drug made up of a positron emitter radionuclide and a biocompatible molecule is necessary to determine physio pathological information.
- Nowadays they may be used as therapeutic drugs.
- ^{18}F -FDG is a well-known radiopharmaceutical. ^{68}Ga FAPI ,recently is going to be used in many cases.

Methods

- Biological tissue Dosimetry is a method to prove its sensitivity and specificity.
- SUVs are measured in tissues.
- MIRD and Monte Carlo methods used for calculations.

Conclusion

- ^{68}Ga -FAPI works very well in PET/CT Diagnostic and therapeutic (Theranostics).

Key Words

Tissue Dosimetry ,
 ^{68}Ga FAPI,Radiopharmaceuticals
 ^{18}F -FDG,PET/CT, Biophysics

Dose Calculations

Spatial and temporal distribution of the radioisotope =the time-activity curves (TACs).

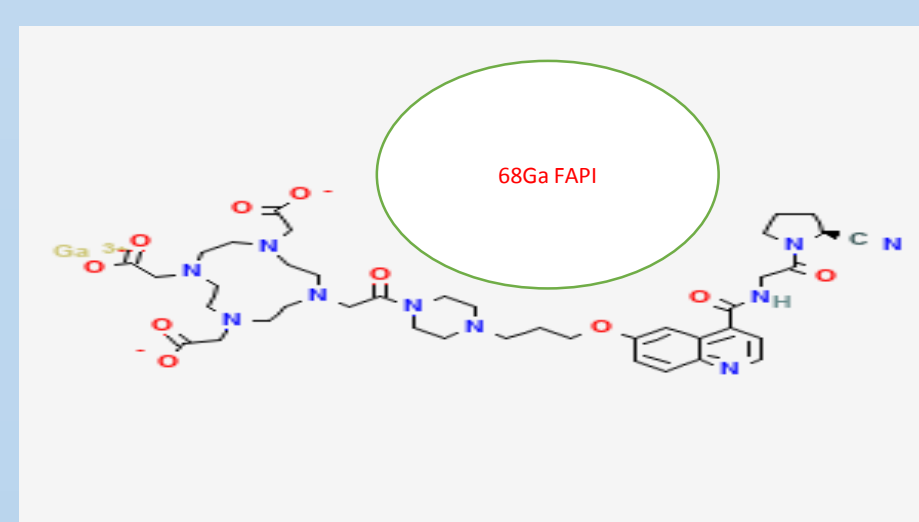
$$CA_i = \int_0^\infty A_i(t) dt$$

CA_i =is the time activity curve of the iTH region
 CA_i =is the cumulated activity .

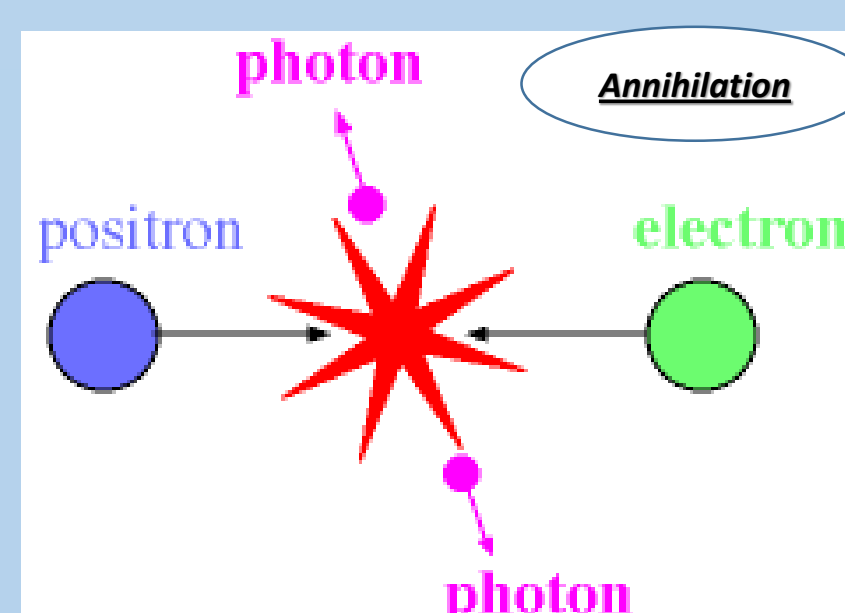
A real Cyclotron Working to produce positron emitters



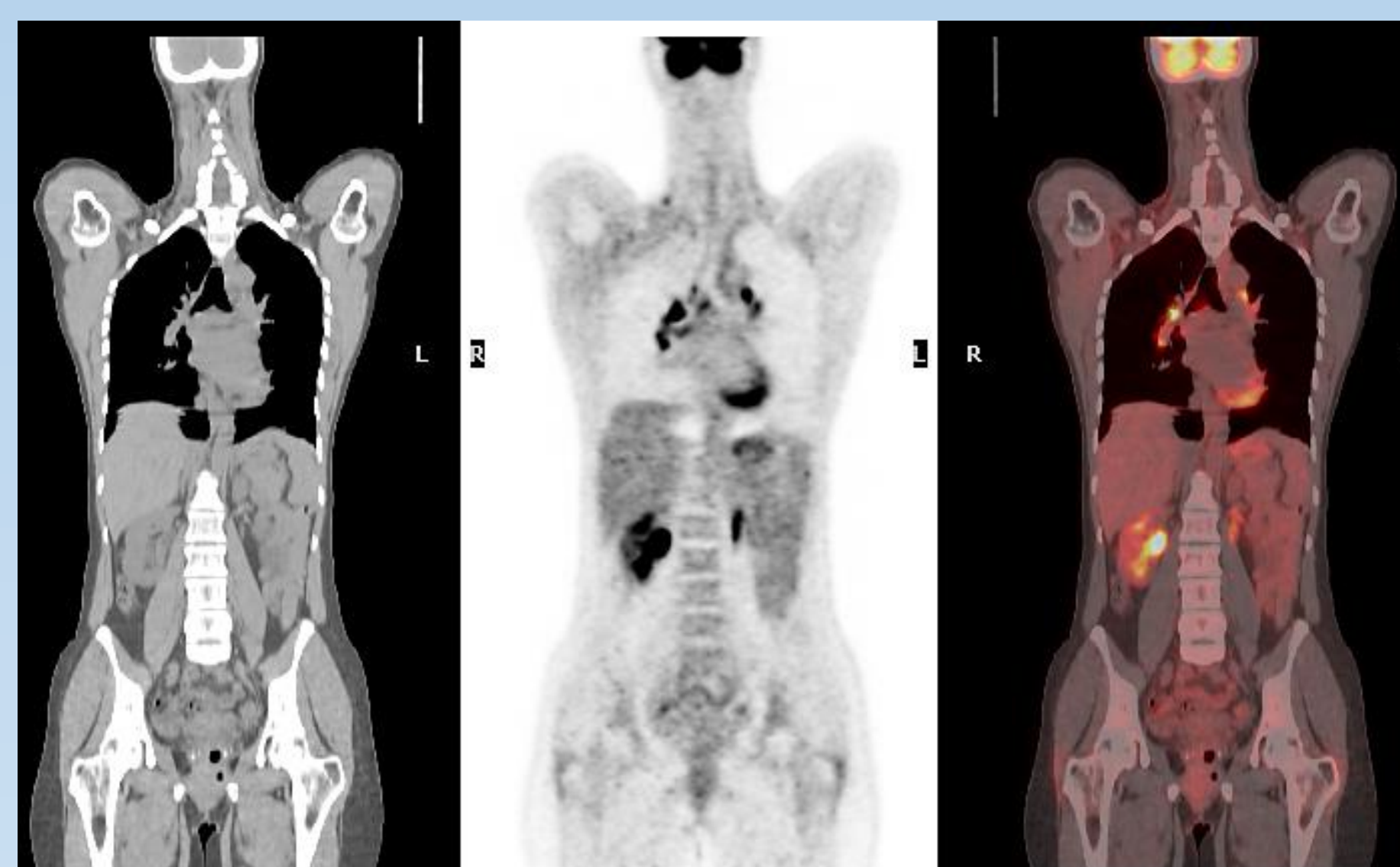
A ^{68}Ga FAPI Molecule



Annihilation Phenomenon



Anatomical Correlation in a PET/CT Scanner

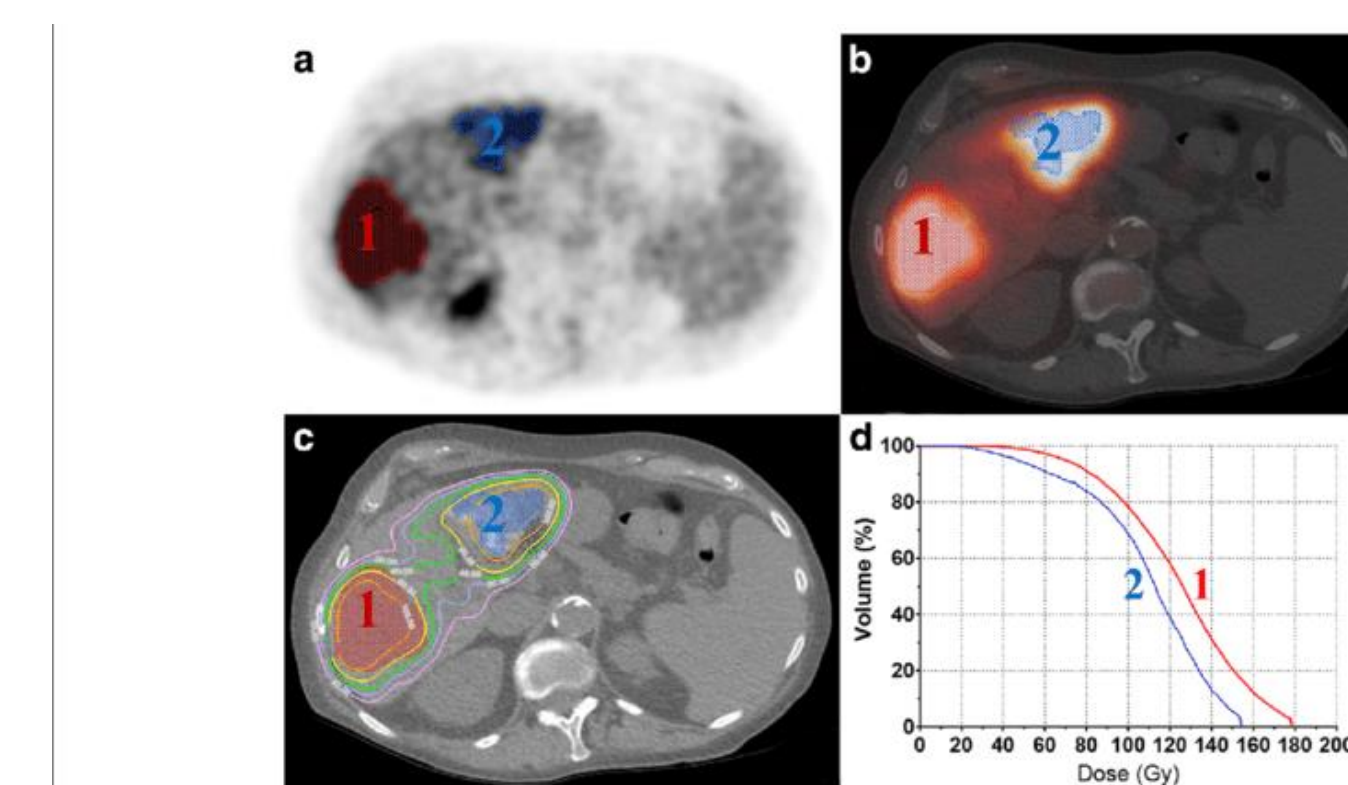


A PET/CT Scanner in reality



Resembles to CT or MRI Scanner

Process of Dosimetry from Imaging to Results



Advantages of ^{68}Ga -FAPI Shown in Dosimetry

- Ga -FAPI is a powerful Radiopharmaceutical in Detection and Treatments in PET/CT Departments.
- It is not dependent on the blood glucose level of patient
- Patient waiting time before start of scanning is reduced.
- Sensitivity and specificity in diagnosis is very high.

References

- Giesel FL, Kratochwil C, Lindner T, et al. (^{68}Ga)-FAPI PET/CT: Biodistribution and Preliminary Dosimetry Estimate of 2 DOTA-Containing FAP-Targeting Agents in Patients with Various Cancers. *J Nucl Med*. 2019;60(3):386-392.
- Yang T, Ma L, Hou H, Gao F, Tao W. FAPI PET/CT in the Diagnosis of Abdominal and Pelvic Tumors. *Frontiers in Oncology*. 2022;11.
- Taveira M. Comparison of (^{68}Ga)-FAPI versus (^{18}F)-FDG PET/CT Staging. *Radiology. Imaging cancer*. 2021;3(2):e219007
- Sanja Ball al, Madhav Parasad Yadav , et al. Biodistribution Pharmacokinetics ,Dosimetry of ^{68}Ga , and the Head to Head Comparison with [^{18}F]-FDG PET-CT in patients with various cancers. *European Journal of Nuclear Medicine*.2020;18.
- Sanja Ball al, Madhav Parasad Yadav , et al. First-In-Human Results of the Biodistribution, Pharmacokinetics and Dosimetry of [^{177}Lu]-DOTA-SA-FAPI; *Pharmaceuticals* 2021,14,1212