

Achievements of the Polish PET centres

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Abstract

PET/CT has established its role in the diagnosis of several diseases, especially in the field of oncology. The first Polish scanner began work in 2003 at the Centre of the Oncology Institute in Bydgoszcz. Further installations were linked with the Ministry of Health programme and with the diagnostic activities of non-public medical companies. On 16 May 2012 there were 14 active PET centres in Poland (8 public and 6 non-public), with 16 scanners. The number of working cyclotrons dedicated to PET-radiopharmaceuticals synthesis is at present 5, with a further 3–4 cyclotrons planned. Currently, the PET/CT technique is widely available in Poland; in 2011 28 199 PET studies were performed in total and oncology represented 97.5% of these. Further development of molecular imaging with PET/CT depends on the introduction of new radiopharmaceuticals and new research programmes in our country.

Key words: positron emission tomography, PET

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Introduction

At present, imaging by PET/CT has established its role in the diagnosis of several diseases, especially in the field of oncology. This opinion is shared by all of the medical communities. Molecular imaging has demonstrated high sensitivity and specificity in the detection of malignant tumors by showing their increased metabolism of glucose, lipids, or amino acids. Also, some clinical trials have shown that metabolic imaging can markedly influence patient management by improving tumor staging, restaging, radiation treatment planning and monitoring of tumor response to therapy [1].

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Historical facts

The first available publication dedicated to positron emission tomography (PET) in Poland is the interview with Prof. Wiesław Graban from 1983 [2].

One of the pioneers of nuclear medicine in our country, he presented his vision of a PET centre in the Medical Academy of Warsaw. It consisted of three stages:

1. Installation of a cyclotron in the University of Warsaw (in the Ochota district of Warsaw);
2. Installation of a scanner in the Department of Nuclear Medicine, Medical Academy of Warsaw (also in the Ochota district);
3. Coupling between both laboratories with pipes (for a distance of about 500 metres).

The Polish Society of Nuclear Medicine (PTMN) had fought for the introduction of this method in Poland for many years. The first PET centre in Poland (with a PET scanner Biograph and a cyclotron) was created in 2003, at the Centre of the Oncology Institute in Bydgoszcz; it was an initiative of the director of the Institute, Dr. Z. Pawłowicz. Further PET installations were linked with the Ministry of Health programme and with the diagnostic activities of non-public medical companies.

NET of PET centres in Poland

On 16 May 2012 there were 14 active PET centres in Poland (8 public and 6 non-public), with 16 PET/CT scanners (Figure 1).

There were 10 scanners installed in public units (2 in Bydgoszcz, 2 in Gliwice, 1 in Kielce, 2 in Warsaw, 1 in Poznań, 1 in Gdańsk and 1 in Chorzów). Private units, possessing 6 scanners, were operating in Warsaw and Poznań and other cities (Wrocław, Łódź, Olsztyn, Kraków) (Table 1).

All scanners installed in Poland are hybrid PET/CT systems, the incorporated CTs being 8–128-row tomographs. The systems are relatively new (the year of installation falls between 2005 and 2011, with an average age of 2 years).

Two new PET centres were to be opened shortly at the Medical Universities of Lublin and Kraków (and are operating at the time of writing). Other centres are planned at the Medical Universities of Szczecin and Białystok and at the public hospital in Kraków.

NET of cyclotrons in Poland

The number of working cyclotrons dedicated to PET-radiopharmaceutical synthesis at present equals 5 (in Bydgoszcz, Gliwice, Kielce, Kraków and Warsaw, Figure 2). Radiopharmaceuticals produced include mainly F-18-FDG, C-11-acetate, F-18-FET, F-18-FLT, and

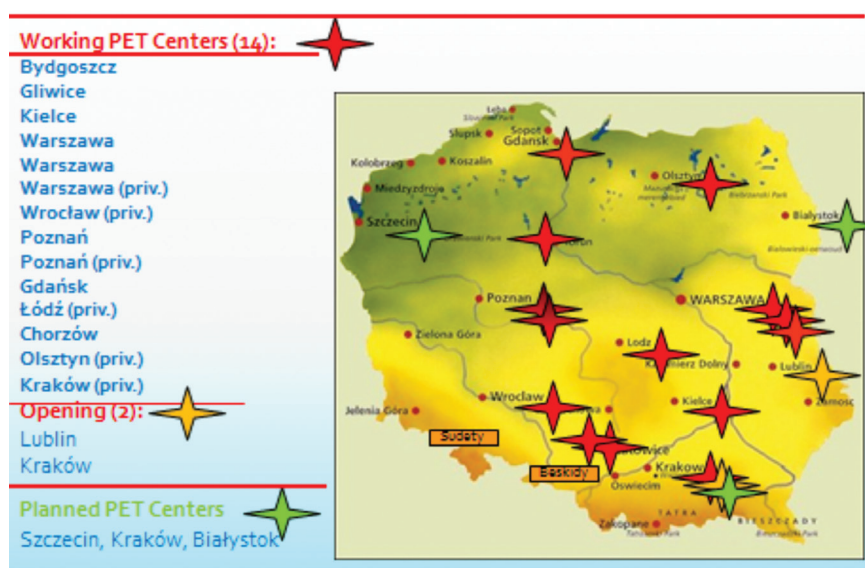


Figure 1. The Polish NET of PET Centres (on 16 May 2012)

Table 1. Characteristics of Polish PET Centres (on 16 May 2012)

Institution	City	Manufacturer	Name of scanner	CT-rows	Year of installation	Cyclotron
Centrum Onkologii im. Prof. F.Łukaszczyka	Bydgoszcz	Siemens	mCT	128	2010	Cyclotron
Centrum Onkologii — Instytut im. M.Skłodowskiej Curie	Gliwice	Siemens	Biograph 6	6	2009	Cyclotron
		Philips	Gemini GXL	16	2005	
Euromedic Diagnostics Polska, NZOZ Mazowieckie Centrum PET-CT	Warszawa	GE	Discovery STE	16	2007	Planned connection with the cyclotron of the Heavy Ion Laboratory (University of Warsaw)
Euromedic Diagnostics Polska, NZOZ Dolnośląskie Centrum Medycyny Nuklearnej	Wrocław	GE	Discovery STE	16	2007	
Euromedic Diagnostics Polska, NZOZ Wielkopolskie Centrum Medyczne	Poznań	GE	Discovery STE	16	2008	
Świętokrzyskie Centrum Onkologii, SPZOZ	Kielce	Siemens	Biograph 64	64	2008	
Samodzielny Publiczny CSK WUM	Warszawa	Siemens	Biograph 64	64	2008	Planned connection with the cyclotron of the Heavy Ion Laboratory (University of Warsaw)
Wielkopolskie Centrum Onkologii	Poznań	Philips	Gemini TF	16	2009	
Centrum Onkologii — Instytut im. M.Skłodowskiej-Curie	Warszawa	Philips	Gemini TF16	16	2009	
Gdański Uniwersytet Medyczny	Gdańsk	Siemens	Biograph mCT 40	40	2010	
Chorzowskie Centrum Pediatrii i Onkologii	Chorzów	Siemens	Biograph mCT (S64)	64	2011	Cyclotron
NZOZ NU-MED PRACOWNIE DIAGNOSTYCZNE Sp. z o.o. — Pracownia PET/CT	Olsztyn	Siemens	Biograph 16	16	2011	
MCD Voxel: Pracownia PET-TK	Łódź	GE	Discovery 600	16	2011	
MCD Voxel: Ośrodek Pet-Tk-Mr	Kraków	GE	Discovery 690	4	2011	

Public Centres (8); Non-public centres (6) — grey background

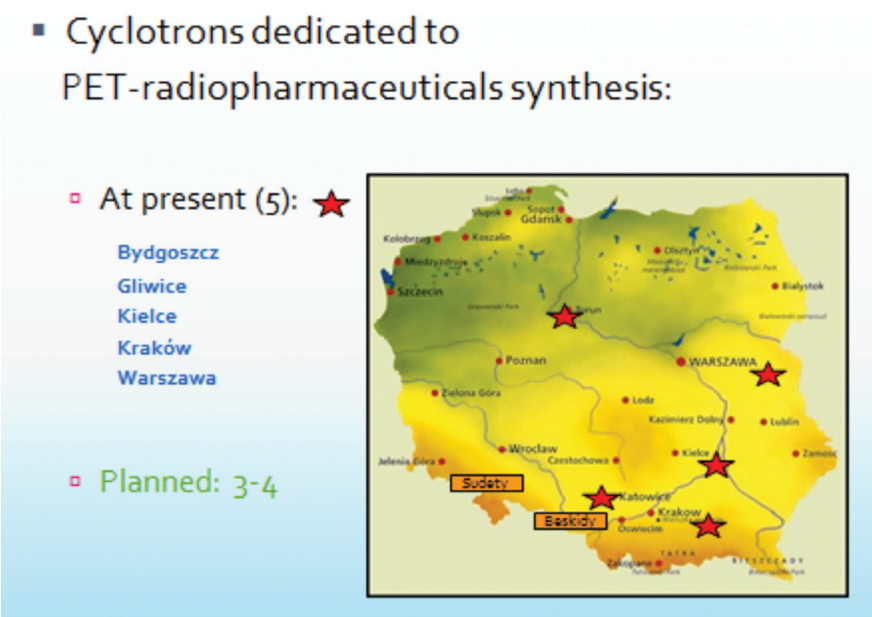


Figure 2. Polish NET of PET cyclotrons (on 16 May 2012)

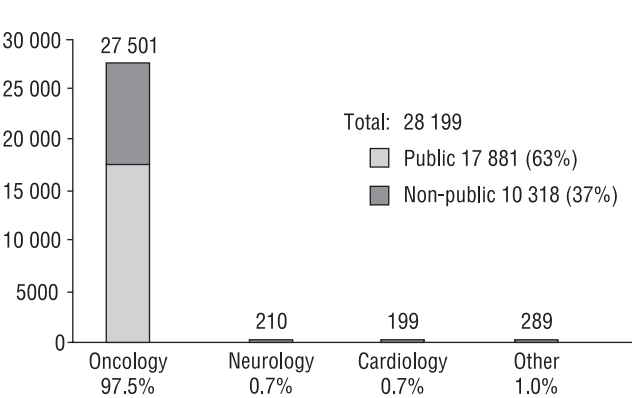


Figure 3. Number of PET studies performed in Poland in 2011

are used internally. Sites not possessing a cyclotron import F-18-FDG from Germany or Austria. A further 3–4 cyclotrons are planned.

Number of PET studies in Poland

In 2011 28 199 PET studies were performed in total: 17 881 (63%) in public centres and 10 318 (37%) in non-public centres (Figure 3). These data indicate a significant increase (multiplication by a factor of 2.4) in the number of PET studies performed last year in comparison with the total number performed in 2008, which was 11 671 [3].

Oncology represented 97.5%, neurology — 0.7%, cardiology — 0.7%, and other diagnostics — 1.0% of the studies performed in 2011.

Radiopharmaceuticals

The radiopharmaceutical used in most clinical studies (> 92%) is fluorodeoxyglucose labelled with fluorine F-18 (18F-FDG, Table 2). The other compounds in use labelled with F-18 are:

Table 2. Radiopharmaceuticals used in Poland for PET studies

Radiopharmaceutical	Number (percentage) of studies
18F-FDG	26 053 (92.4%)
18F-other	937 (3.4%)
68Ga-DOTATATE	1151 (4.2%)
11C-acetate	58 (0.2%)

fluorocholine, NaF (sodium fluoride), FLT (fluorothymidine), FET (fluorothymidine), FMISO (fluoromisonidasol), DOPA and DOPAMINE. Gallium-68 (68Ga-DOTATATE) is used in > 4% of studies and there have been some single studies performed with carbon-11 (11C-acetate).

Refunding

The National Health Fund (NFZ) covers the costs of about 95% of PET studies performed in Poland. The list of refunded studies includes:

1. in oncology: head and neck cancers, melanoma, lymphoma, colorectal cancers, lung cancers, pancreatic cancer, recurrence of ovarian cancer, thyroid cancer, bone metastases, esophageal cancer, prostate cancer;
2. in cardiology: viability of myocardium;
3. in neurology: epilepsy, brain tumors.

Main topics in nuclear medicine departments in Poland

- Radiopharmaceuticals are used in the following clinical situations:
- 18F-FDG in evaluation of lymphoma (international programme);
 - 18F-FDG in evaluation of brain degenerative diseases and epilepsy;

- 18F-FDG in evaluation of cardiac viability;
- 18F-FDG in evaluation of the perivascular fat tissue in pathogenesis of cardiac diseases;
- 18F-fluorothymidine in evaluation of gastric cancers;
- 18F-fluorothyrosine in evaluation of brain tumors;
- 18F-DOPAMINE or -DOPA in evaluation of NET;
- 68Ga-DOTATATE in evaluation of NET.

Conclusions

In conclusion, the actual state of PET in Poland is satisfactory. The number of PET/CT scanners is adequate for the number of patients who need examination. Currently, there is one scanner for every 2.3 million inhabitants. The number of cyclotrons also seems to be sufficient. At present only one centre produces 18F-FDG commercially (IASON Poland in Kielce). However, in the near future 3–4 centres will be ready to register the production of radiopharmaceuticals for PET. The number of PET studies performed in 2011 was about 740 per million citizens and the vast majority of examinations served oncology diagnostics with 18F-FDG.

The progress of the PET technique in Poland concerns the use in routine examinations of other radiopharmaceuticals, like 18F-fluorocholine or 18F-fluorothyrosine. Cardiac perfusion diagnostics with rubidium 82Rb is a possible next direction of PET development in Poland. New types of brain examinations with 18F-DOPA (dopaminergic system visualisation) and with radiopharmaceuticals for visualisation of amyloid in patients with degenerative diseases should be implemented. The development of basic research with positron emission tomography should be introduced in Poland by creating laboratories equipped with high-resolution animal-PET. The progress of PET will also be associated with the implementation of PET-MRI [4].

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