

Increase in utilization of myocardial perfusion imaging in the Czech Republic: activity and practice of nuclear cardiology, 2003

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[Received 18 I 2005; Accepted 29 III 2005]

Abstract

BACKGROUND: The second survey of nuclear cardiology in the Czech Republic was conducted to ascertain whether the activity had increased since the first survey in 2001; we also intended to identify new trends in clinical practice.

MATERIALS AND METHODS: All 46 departments of nuclear medicine in the Czech Republic completed a questionnaire concerning nuclear cardiology activity in 2002–2003 and current clinical and technical practices.

RESULTS: There were 66 SPET cameras in 2003 in comparison with 54 SPET cameras in 2001. Of the 46 centres, 39 (85%) provided nuclear cardiology service. The total number of cardiac studies was 19,261 in 2003 (i.e. 1.9 studies/1,000 population; myocardial perfusion imaging (MPI) studies accounted for 91.3% of total nuclear cardiology. In 2001–2003, the utilization

rate of MPI increased annually by 10%, 13% and 21% respectively. Twenty-six departments (67%) reported that the number of MPI had increased. The utilization of gated SPET method showed a very positive trend; as only 39% of all MPI studies were acquired using ECG-gating in 2001, but in 2003, there was an increase to 61%. We observed no increase in utilization of attenuation correction (3 centres in 2003 in comparison with 5 centres in 2001). Despite new PET capacity in the Czech Republic, the total number of FDG cardiology studies was somewhat lower in 2003 than in 2001 (155 compared with 163 studies). **CONCLUSIONS:** Our data documented substantial growth in the number of MPI examinations in 2001–2003. However, Czech Republic nuclear cardiology activity still remained below the European average (2.2 studies/1,000 population in 1994); a further increase in MPI activity is necessary to adequately support the needs of cardiac patients.

Key words: nuclear cardiology, myocardial, perfusion imaging, survey, Czech Republic

Introduction

This is the second survey of nuclear cardiology activity and practice in the Czech Republic. The first survey showed that the total number of nuclear cardiac studies was 15,740 in 2001 (1.5 studies/1,000 population/year); the most frequently employed method was myocardial perfusion imaging (MPI), the frequency of which had increased by 10% compared to 2000 [1]. Nevertheless, Czech Republic nuclear cardiology activity in 2001 remained below the European average (2.2/1,000 population in 1994) and, particularly, below activity in the USA (15/1,000 in 1997) [2–4]. The current survey was conducted predominantly to ascertain whether Czech Republic nuclear cardiology activity had increased since 2001. As only 39% of all MPI studies were acquired using ECG-gating in 2001, we also intended to identify new trends in current practice.

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Material and methods

On behalf of the Working Group of Nuclear Cardiology of the Czech Society of Cardiology, a questionnaire was sent to all nuclear medicine departments in the Czech Republic in March 2004. The questionnaire was designed to survey the level of technical equipment, use of radiopharmaceuticals, imaging protocols, data collection methods and the number of MPI studies and other nuclear cardiology methods. We collected technical data concerning 2003, and the number of examinations carried out in 2002 and 2003. All departments were asked to consider stress/rest myocardial perfusion imaging as a single study and were assured that all individual data would be kept strictly confidential. Of 46 centres, 38 (83%) responded immediately (66% in previous survey); the others had to be reminded by e-mail or by phone (the total response rate was 100%).

Results

In 2003, there were 112 scintillation cameras in operation in the Czech Republic, of which 46 were planar and 66 were tomographic (SPET); there were also three dedicated cameras for positron emission tomography (PET). Of the 66 SPET cameras, 21 were one-detector, 44 two-detector and only one was three-detector. In 2003, the average age of the SPET cameras was 5 years (38% of the SPET cameras were more than eight years old). Eight new SPET cameras were installed in 2002 and six new SPET cameras in 2003. The number of departments and SPET cameras in 2001 and 2003 in the Czech Republic are summarized in Table 1. Although some departments equipped with SPET-capable cameras are focused on fields other than nuclear cardiology (39 of the 46 departments used nuclear cardiology methods), the greater tomographic capacity enabled a marked reduction in use of planar methods for MPI studies (six centres used planar methods in 2000, three centres in 2001, but only one in 2003).

The total number of nuclear cardiology examinations in 2003 was 19,261, while in 2001 only 15,740 examinations took place. These figures are equivalent to activity levels of 1.5 studies/1,000

Table 1. Nuclear medicine departments and SPET cameras in the Czech Republic in 2001–2003

	2001	2003
Departments of Nuclear Medicine in the Czech Republic	48	46
Departments with nuclear cardiology service	39	39
Departments which provided SPET MPI	36	38
Planar MPI	3	1
Number of SPET cameras in the Czech Republic	54	66

population/year in 2001 increasing to 1.9/1,000/year in 2003. The most frequent examination was MPI: 12,854 examinations in 2001 and 17,582 in 2003 (Table 1). Figure 1 gives the frequencies with which different nuclear cardiology methods are employed in the Czech Republic. MPI studies accounted for 91.3% of total nuclear cardiology in 2003 in comparison with 81.7% in 2001. In 2003, the second most common method of nuclear cardiology remains radionuclide ventriculography, with 1,174 examinations (2,317 in 2001), followed by first-pass angiocardiology with 329 examinations (406 in 2001). Five centres carried out 155 studies of glucose metabolism using ^{18}F -Fluorodeoxyglucose (FDG), of which 62 were performed on dedicated PET cameras; the others were performed using two SPET cameras with high-energy collimators for imaging the 511-keV photons and one hybrid coincidence camera. Despite the new PET capacity in the Czech Republic, the total number of FDG cardiology studies decreased in 2003 in comparison with 2001. In 2001–2003, the frequency of utilization of MPI increased yearly by 10%, 13%, and 21%, respectively (Table 2). In 2003, 26 of 39 departments (67%) reported that the number of MPI had increased. In 2003, the share of SPET on MPI increased to 99.8%, from 91.4% in 2000 (Figure 2). The use of these methods was highly uneven: while three departments that performed more than 1,000 examinations per year accounted for 28% of all MPI studies, 16 out

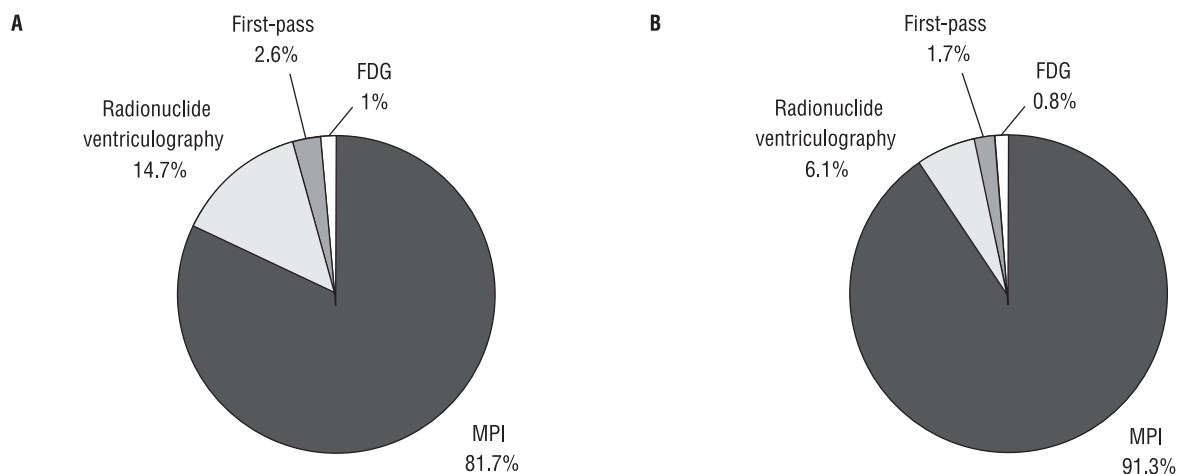
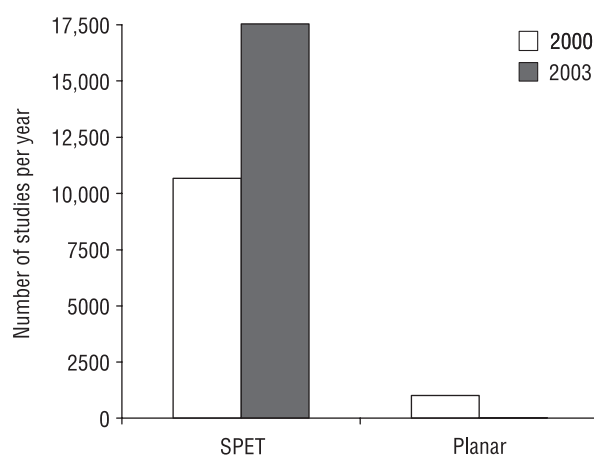


Figure 1. Frequency with which different nuclear cardiology methods are employed in the Czech Republic: % of the total number of examinations in 2001 (A) and in 2003 (B).

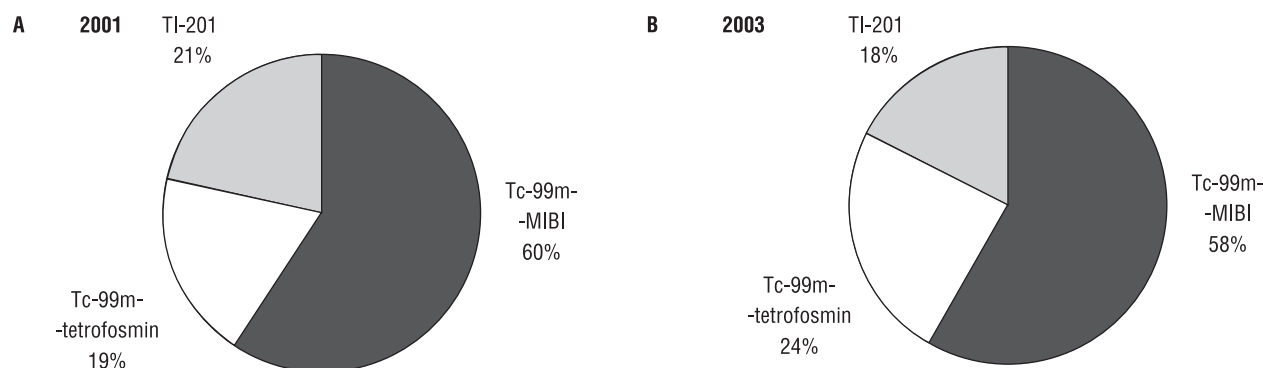
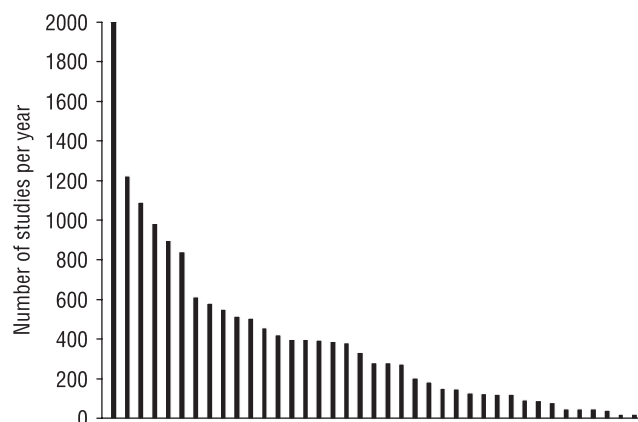
Table 2. Utilization of MPI between 2000 and 2003

Year	Total number of MPI examinations	Change	Change (%)
2000	11,734		
2001	12,854	+ 1.120	+ 10%
2002	14,519	+ 1.665	+ 13%
2003	17,582	+ 3.063	+ 21%

**Figure 2.** Increase in MPI studies performed with SPET in 2003 as compared with 2000, and accompanying decline in the number of studies performed with planar imaging.

of 39 centres (41%) performed less than 200 examinations per year and accounted for only 11% of the examinations (Figure 3).

^{99m}Tc -labelled tracers were clearly more frequently used than ^{201}Tl (Figure 4). Nineteen departments (49%) reported that they still made use of ^{201}Tl , but only one department (3%) relied exclusively on this radiopharmaceutical. Another 18 departments used ^{99m}Tc -labelled tracers in the majority of patients and ^{201}Tl in selected patients (when asked about viability). Most departments reported a preference for a 2-day protocol for imaging using ^{99m}Tc -labelled tracers. Where a 1-day protocol was used, there was a preference for a stress/rest sequence (Figure 5).

**Figure 4.** Choice of perfusion tracer: % of total number of examinations in 2001 (A) and in 2003 (B).**Figure 3.** Numbers of MPI studies performed at individual nuclear medicine departments in 2003.

In 61% of all MPI studies, ECG gating was used. Twenty-seven departments (69%) reported that they had the possibility of using gated SPET, 16 (41%) used this method regularly, the other 11 departments used it in selected cases. Twenty-five departments reported that they had the possibility of using nuclear cardiology quantitative software (including normal database, summed scoring system, and left ventricular ejection fraction calculation), six of them had the possibility of using two different software packages. There were eleven 4D-MSPECT programs, eleven Emory Cardiac Toolbox and nine Cedars Quantitative Perfusion SPECT programs in the Czech Republic (Figure 6). There were also six departments equipped with software for calculation of left ventricular ejection fraction only (without normal database). Three centres (8%) used attenuation correction (simultaneous transmission/emission) and this was applied to less than 8% of all MPI studies. Thirty-four centres (87%) used prone projection in 2003.

Discussion

The ascertained increase in the number of examinations using the most common method of nuclear cardiology — MPI — in the Czech Republic corresponds with the general trend in Europe and

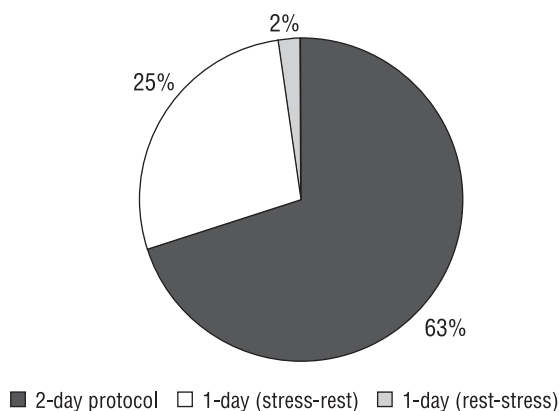


Figure 5. Choice of imaging protocols with ^{99m}Tc -labelled tracers (% of the total number of departments).

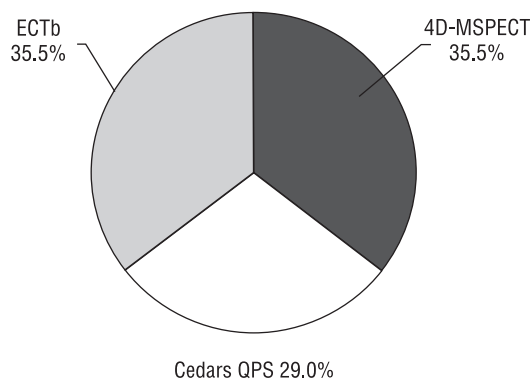


Figure 6. Choice of the nuclear cardiology quantitative software package in 2003. 4D-MSPECT (University of Michigan Medical Center), Cedars QPS (Cedars Quantitative Perfusion SPECT, Cedars-Sinai Medical Center, Los Angeles), ECTb (Emory Cardiac Toolbox, Emory University, Atlanta).

in the USA. In 2001, the first survey showed that the frequency of MPI had increased by 10% compared to 2000 [1]. The current survey extends this observation to 2002 and 2003; the utilization rate increased annually by 13% and 21%, respectively (Table 2). It is a good sign that an increase in myocardial perfusion examinations was reported by 26 out of 39 (67%) departments (the same percentage as in the first survey). The main reason for the increase in MPI activity is undoubtedly dramatic changes in the management of coronary artery disease (rapid growth in the utilization of invasive cardiology techniques in particular), resulting in an increased reliance on MPI studies for guiding patient management decisions.

The Czech annual average, however, of 1.9 nuclear cardiology studies per 1,000 inhabitants is still somewhat lower than the European average (2.2 studies/1,000 population in 1994) [2], and markedly lower than the USA average (15 studies/1,000 in 1997) [3]. The last European survey revealed a high level of unevenness of these activities in European countries in 1994, but more recent data are scant. Newer data have been available from Spain (1.1 studies/1,000 in 1999), Denmark (0.93 studies/1,000 in 2001) and the United Kingdom (1.12 studies/1,000 in 1997) [5–7]. It has been estimated that since 1994, numbers of MPI studies have grown at a compound rate of about 5% per year in Europe [8]. The optimum frequency of nuclear cardiology examinations is not known as yet. We agree with Prvulovich and Metcalfe [7] that the optimum number of MPI studies should be higher than the European average in 1994, and it may range from 4–5 studies/1,000 inhabitants a year.

The choice of perfusion tracers and choice of imaging protocols in the Czech Republic remain nearly identical as in the previous survey (Figure 4, 5) [1]. The increase in the gated SPET imaging from 39% of all MPI studies in 2001 to 61% in 2003 is a very positive trend related to the gradual equipping of departments with new SPET cameras. The equipment of most centres with quantitative software packages was new information from the current survey. However, some limitation for expansion of new techniques such as gated SPET or quantitative perfusion SPET was the average age of the SPET cameras (5 years). In 2003, 38% of the SPET cameras were more than eight years old in comparison with 13% in 2001. Attenuation correction was rarely used and we observed no increase in utilization of this technique: three centres in 2003 in comparison with five centres in 2001. However, prone

imaging was used at 34 centres (87%) in 2003 in comparison with 27 centres (69%) in 2001. Despite the new PET capacity in the Czech Republic, the total number of FDG cardiac studies was somewhat lower in 2003 than in 2001; the reason being that PET centres are strongly focused on oncology studies nowadays.

In conclusion, our data documented a rapid increase in the utilization rate of MPI in the Czech Republic in the past few years. The main reason for the increase in MPI activity is the dramatic changes in the management of coronary artery disease, resulting in an increased reliance on MPI studies for guiding patient management decisions. Despite recent increases, however, nuclear cardiology in the Czech Republic remains below the European average. We are sure that a further increase in MPI activity is necessary to adequately support the needs of cardiac patients.

Acknowledgements

The authors are grateful to all those colleagues at nuclear medicine departments who completed the questionnaires.

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