

Spanish Registry of Cardiac Catheterization and Coronary Interventions. Thirteenth Official Report of the Working Group on Cardiac Catheterization and Interventional Cardiology of the Spanish Society of Cardiology (1990-2003)

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The results of the Registry of the Working Group on Cardiac Catheterization and Interventional Cardiology of the Spanish Society of Cardiology for 2003 are presented. Data were obtained from 112 centers representing nearly all cardiac catheterization laboratories in Spain; 104 centers performed mainly adult catheterization and 8 carried out pediatric procedures only.

In 2003, 105 939 diagnostic catheterization procedures were performed, including 90 939 coronary angiograms, representing a total increase of 8.5% in comparison to 2002. The population-adjusted rate was 2171 coronary angiograms per 10⁶ inhabitants.

Coronary interventions increased by 14.4% in comparison to 2002, with a total of 40 584 procedures and a rate of coronary interventions of 969 per 10⁶ inhabitants. Coronary stents were used in 92.5% of the procedures (47 249 units implanted, for a total increase of 22% in comparison to 2002). About one fifth (20.2%) of the implanted stents were drug-eluting stents (11 699 units). A total of 6080 percutaneous coronary interventions were done in patients with acute myocardial infarction, representing an increase of 27.5% in comparison to 2002, and accounting for 14.9% of all interventional procedures.

Of the noncoronary interventions recorded, we note the increase in percutaneous mitral valvuloplasties (21.6%) and atrial septal defect closures (86%), and also the increase in pediatric interventions (13.3%). In conclusion, we emphasize the high rate of reporting by laboratories, which allows the Registry to compile data that are highly representative of the activity at cardiac catheterization laboratories in Spain.

Key words: Health registries. Coronary angiography. Coronary angioplasty. Stent. Cardiac catheterization.

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Results and consultations available at: www.hemodinamica.com

Registro Español de Hemodinámica y Cardiología Intervencionista. XIII Informe Oficial de la Sección de Hemodinámica y Cardiología Intervencionista de la Sociedad Española de Cardiología (1990-2003)

Se presentan los resultados del Registro de Actividad de la Sección de Hemodinámica y Cardiología Intervencionista de la Sociedad Española de Cardiología del año 2003. Se recogen datos de 112 centros, casi la totalidad de los laboratorios del país. De ellos, 104 realizaron su actividad sobre todo en pacientes adultos y 8 exclusivamente en pacientes pediátricos.

Se realizaron 105.939 estudios diagnósticos con 90.939 coronariografías, lo que representa un aumento del 8,5% respecto al año 2002 y una tasa de 2.171 coronariografías por millón de habitantes. Se efectuaron 40.584 procedimientos de intervencionismo coronario, con un incremento del 14,4% respecto al año anterior y una tasa de 969 intervenciones por millón de habitantes. Se empleó *stent* intracoronario en el 92,5% de los procedimientos, con 47.249 unidades utilizadas (incremento del 22%), de las cuales 11.699 fueron *stents* liberadores de fármacos antiproliferativos (20,2%). Se llevaron a cabo 6.080 procedimientos de intervencionismo en el infarto agudo de miocardio, lo que supone un 27,5% más respecto al año 2002 y el 14,9% del total de las intervenciones coronarias percutáneas.

En el intervencionismo no coronario destaca un aumento del número de valvuloplastias mitrales (21,6%), un incremento de los cierres percutáneos de comunicación interauricular en pacientes adultos (86%) y un ligero aumento de los procedimientos intervencionistas en pacientes en edad pediátrica (13,3%). Finalmente, destacamos el alto grado de participación de centros en el registro, lo que hace que los datos aquí presentados sean representativos de la actividad hemodinámica en nuestro país.

Palabras clave: Registros sanitarios. Angiografía coronaria. Angioplastia coronaria. Stent. Cateterismo cardíaco.

ABBREVIATIONS

PCI: percutaneous coronary intervention.
AMI: acute myocardial infarction.

INTRODUCTION

Health registries are an invaluable source of information on actual clinical practice. Clinical trials allow evidence-based guidelines for clinical procedures to be drawn up, but the data from registries are what provide an indication of the actual results of application of these guidelines in real clinical practice. The findings of such registries help orient interventions towards improvement of health care in its many facets such as investigation, prevention, treatment and distribution of resources. Since 1992, the Working Group on Catheterization and Interventional Cardiology of the Spanish Society of Cardiology has endeavored to investigate the activity carried out in Spain, in both the public and private sector. These findings are presented in an official report. As in previous years,¹⁻¹² this 13th report published in *REVISTA ESPAÑOLA DE CARDIOLOGÍA* presents data from almost all Spanish hospitals and so can be considered a reference that truly reflects activity in Spain.

MATERIAL AND METHOD

Data for the Registry were collected using a questionnaire (Annex 1) sent to all cardiac catheterization laboratories in Spain. This questionnaire underwent some changes from previous years and could be filled out either on paper or electronically as a file saved on a disk or on-line at the web page of the Working Group. The company Izasa collaborated in both the distribution and the collection of questionnaires, and the board of the Working Group were responsible for data analysis and for publishing this article. The population data used for the different calculations of rates per million inhabitants, both for the whole of Spain and for each autonomous region, were obtained from the 2003 estimate of the National Statistics Institute (<http://www.ine.es>). The Spanish population in 2003 was taken to be 41 874 277 inhabitants.

RESULTS**Infrastructure and Resources**

The present Registry comprised 112 hospitals (Annex 2) representing all public centers and 93% of the

private ones with cardiac catheterization activity in 2003. Of these centers, 104 admitted mostly adult patients, 16 admitted both adults and children, and 8 hospitals treated children only.

Adult Hospitals

The 104 adult centers had a total of 139 cardiac catheterization laboratories, of which 124 (89%) were digital. There were therefore 2.48 centers and 3.32 laboratories per million inhabitants. Thirty-five centers had 2 or more cardiac catheterization laboratories, and 78% of the centers had some sort of automated coronary analysis system. Forty-one centers were private hospitals (39.4%) and the remaining 63 (61.6%) belonged to the Spanish National Health Service. Diagnostic and interventional procedures were undertaken by 98% of the hospitals, whereas 2% were dedicated exclusively to diagnostic procedures. A 24-hour emergency team was on call in 59% of the hospitals (65% of the public ones and 51% of the private ones). Cardiac surgery was performed in 75% of the centers (78 hospitals). Coronary interventions were undertaken in 24 hospitals which did not perform cardiac surgery. The total number of specialists was 298 (2.98 per center, corresponding to 7.11 specialists per million inhabitants—still lower than the 8 specialists per million inhabitants in the latest figures published by the European registry in 1995).¹³ There were 362 nurses, corresponding to a mean of 4.3 per hospital (2.9 per laboratory in the public sector) and 86 radiology technicians, corresponding to a mean of 3.3 per laboratory (2.9 per laboratory in the public sector).

Pediatric Hospitals

Eight hospitals, with 9 laboratories (7 of which were digital), admitted children only. All of these undertook interventional procedures and 7 (87%) had a 24-hour emergency team on call. The staff comprised 19 specialists (2.4 per hospital) and 22 nurses (2.8 per hospital).

Diagnostic Activity

A total of 105 939 diagnostic catheterization procedures were undertaken in Spain in 2003—8.5% more than in 2002. Of these procedures, 90 939 were coronary angiograms—representing an increase of 8.6%. A total of 2171 coronary angiograms were performed per million inhabitants, a similar number to Greece, Portugal, and Hungary and well below the number of procedures in countries such as Germany (7462/million inhabitants), Austria (4800/million inhabitants), or France (3935/million inhabitants) according to the latest European Registry published in 2001.¹⁴ Figure 1 shows the distribution of diagnostic procedures in 2003

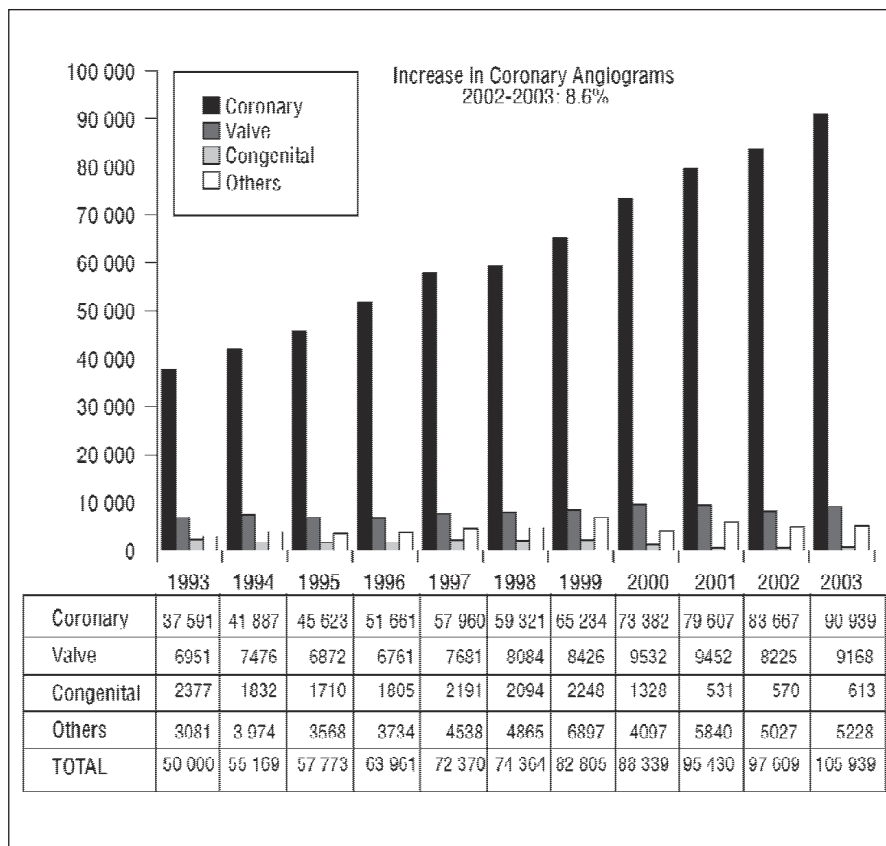


Fig. 1. Number and type of diagnostic procedure for the years 1993 to 2003.

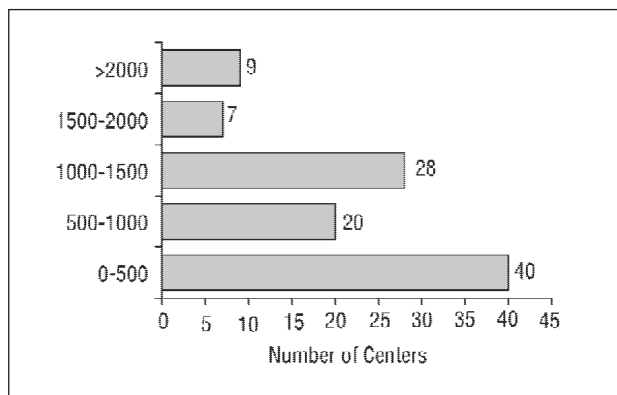


Fig. 2. Distribution of centers according to number of coronary angiograms.

and how this distribution has changed since 1993. Apart from the increase in coronary angiograms, the tendency towards a decrease in the number of diagnostic procedures in patients with valve disease was inverted and increased 11% between 2002 and 2003.

The radial approach was used in 10 359 procedures (9.8%)—an increase of 101% with respect to the previous year. Percutaneous vessel closure devices (for both diagnostic and therapeutic procedures) were used in 20 553 patients (an increase of 43.2% compared to 2002), 11 524 with collagen (an increase of 56% com-

pared to 2002) and 6868 with suture (an increase of 33.4% compared to 2002).

Forty-four hospitals (42.3%) performed more than 1000 coronary angiograms per year and 9 of these (8.7%) performed more than 2000. In contrast, 40 hospitals (38.5%) performed fewer than 500 coronary angiograms per year (Figure 2), but only 5 of these were in the public sector (9.5%). Thus, 1018 procedures were carried out per center and 762 per laboratory—fewer than the European average of 1019 procedures per laboratory for 2001.¹⁴ The number of coronary angiograms per center was 874, that is slightly higher than in 2002 but still lower than the already outdated number from 1997 for most countries of western Europe^{15,16} and the 934 coronary angiograms reported per centre in the 1999 European Registry.¹⁶ It is of note that private hospitals performed 345 coronary angiograms per center, whereas public ones carried out 1241 coronary angiograms per center.

The trend in recent years towards a lower rate of increase in diagnostic procedures disappeared in 2003. The increase in the number of diagnostic procedures was due not just to more coronary angiograms but to more interventions in all four subgroups into which these procedures were divided.

The number of coronary angiograms per million inhabitants continued to vary greatly from one Spanish

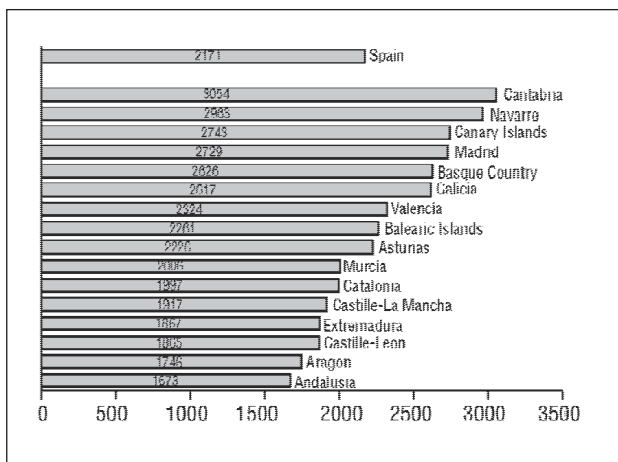


Fig. 3. Distribution of coronary angiograms by Spanish autonomous region per million inhabitants.

autonomous region to another in 2003. The breakdown according to autonomous region is presented in Figure 3.

Among intracoronary diagnostic procedures, use of intravascular ultrasound increased substantially—2143 procedures were performed, corresponding to an increase of 25% compared to 2002. The number of procedures with coronary pressure wires showed a small decrease of 17% compared to 2002, with 1128 procedures being performed. The use of coronary Doppler flow wires was similar to previous years (113 patients).

Coronary Interventions

In 2003, Spanish hospitals performed 40 584 percutaneous coronary interventions (PCI), an increase of 14.4% compared to the previous year. Thus, 969 PCI

were done per million inhabitants (Figure 4). This is similar to the average reported by the European Registry corresponding to 2001¹⁴ (990 angioplasties per million inhabitants), but lower than the number for leading countries for PCI at the time of the registry such as (in decreasing order) Germany, Belgium, Austria, Switzerland, Island, France, Luxembourg, the Netherlands, Czech Republic, Denmark, Italy, and Sweden, all of which exceeded 1000 PCI per million inhabitants. The average number of interventions per hospital with PCI activity was 398, with 296 per laboratory and 136 per operator. The European mean for PCI per cardiac catheterization laboratory was 325 in 2001.¹⁴ The mean PCI per hospital was 142 in private hospitals and 570 in those in the public sector.

The percentage of PCI per coronary angiogram was 44.6% in 2003 (compared to 41% in 2002)—a higher percentage than the European average for 2001 (33%). At least one restenotic lesion was treated during the intervention in 6% of the patients. In 2003, 11 173 multivessel PCI were performed, corresponding to 28% of all PCI, the same percentage as in 2002. Likewise, no differences were observed with respect to 2002 for percentage of interventions performed during diagnosis (30 702 procedures, 76%). The European average for PCI at the same time as the diagnostic procedure was 52% in 2001.¹⁴

Radial approach was used for PCI in 5331 patients (13.1%)—141% more than in 2002. Grafts accounted for 1160 PCI; of these, 85.7% were saphenous veins grafts and the remaining procedures (14.3%) were mammary artery grafts. A total of 781 PCI were performed in the left anterior descending artery, which was protected in 31% of patients.

Figure 5 shows the number of centers according to number of PCI. As in previous years, many hospitals (55%) perform fewer than 400 PCI a year and some

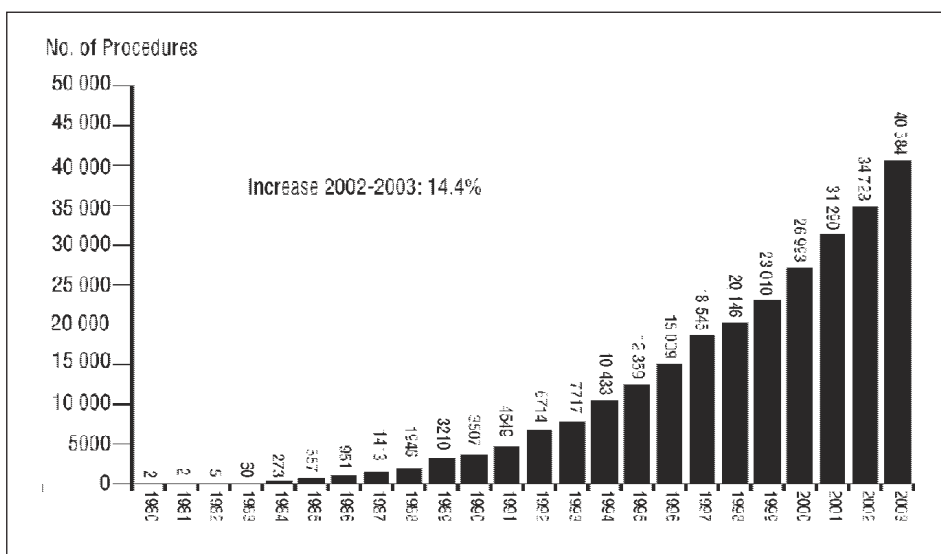


Fig. 4. Change in number of percutaneous coronary interventions between 1980 and 2003.

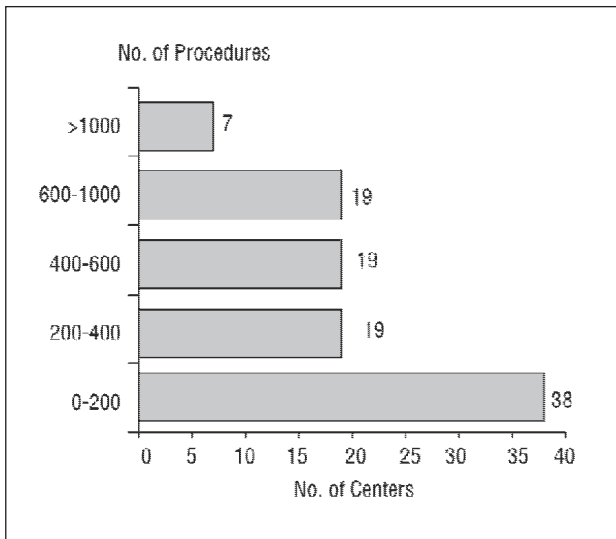


Fig. 5. Distribution of centers according to the number of percutaneous coronary interventions performed in 2003.

even perform fewer than 200 PCI per year (37%). Seven hospitals performed more than 1000 PCI in 2003. Figure 6 shows the number of PCI per million inhabitants in the different autonomous regions in Spain; the differences reflect those already observed for diagnostic procedures. We should point out that, as with coronary angiograms, some autonomous regions show a high percentage of PCI because their hospitals treat patients from neighboring regions.

Glycoprotein IIb-IIIa inhibitors were used as adjunct pharmacological therapy in 12 804 procedures, corresponding to both an absolute increase (28.4%) and a relative increase compared to 2002 (31.6% of interventions in 2003 vs 28.7% in 2002). Use of glycoprotein IIb-IIIa inhibitors in interventions ranged from 0% to 83% among the different hospitals. Intraaortic balloon counterpulsation was used in 664 patients and percutaneous extracorporeal circulation in 4 patients.

Overall results for coronary intervention were similar to previous years—the success rate was 94.7%. Failures without complications were reported in 3.2% interventions and failures with complications in 2.1%. Complications caused death in 0.9% of the interventions and acute myocardial infarction (AMI) in 1.1%, and 0.1% required emergency surgery.

Interventions in Acute Myocardial Infarctions

A total of 6080 PCI were done in patients with acute myocardial infarction, representing an increase of 27.5% compared to 2002, and accounting for 14.9% of all interventional procedures (Figure 7). Of these, 64.1% were primary PCI (59.2% in 2002), 26.2% rescue procedures (30% in 2002), and 9.7% facilitated procedures (10.8% in 2002) (Figure 8). Spanish hospitals undertook 3900 primary PCI, re-

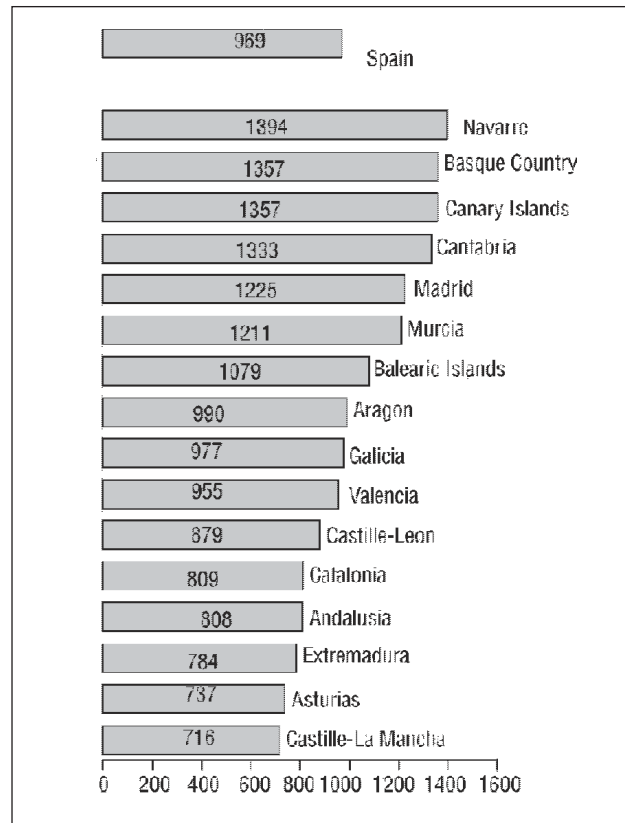


Fig. 6. Distribution of percutaneous coronary interventions per million inhabitants by Spanish autonomous region.

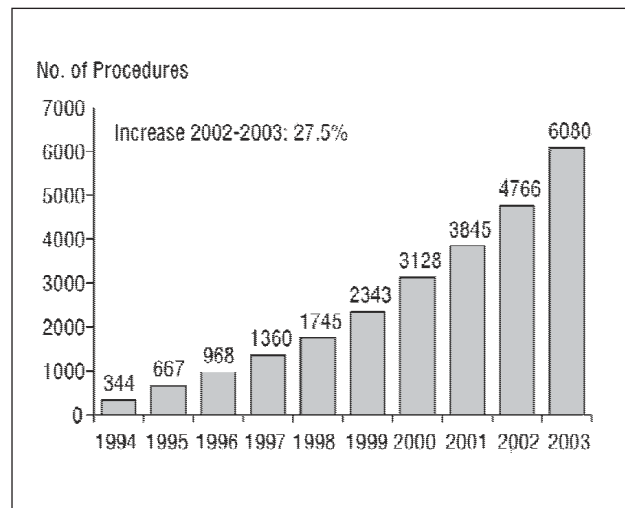


Fig. 7. Percutaneous coronary interventions in patients with acute myocardial infarction: Change over the study period 1994-2003.

presenting an increase of 38.2% with respect to 2002 and a substantial percentage share of all types of PCI. Data on the number of AMI that met criteria for reperfusion treatment are limited, but the number of PCI in patients with AMI remains low compared to the more than 40 000 patients thought to have been

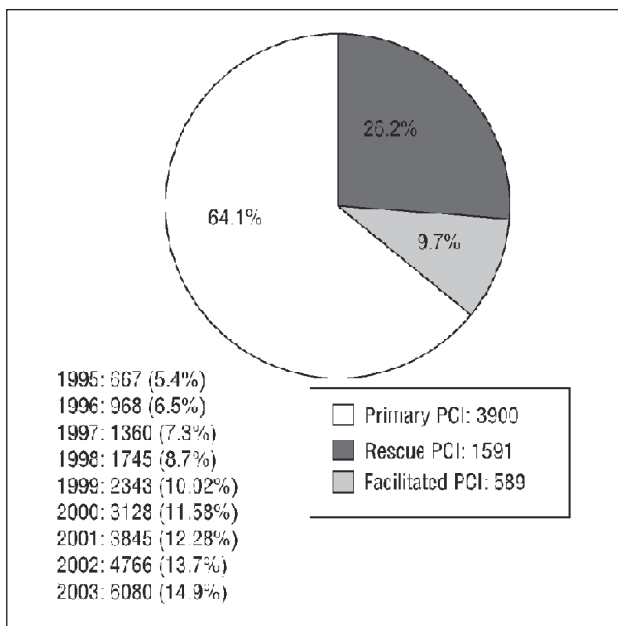


Fig. 8. Percutaneous coronary interventions (PCI) in patients with acute myocardial infarction: Distribution of type of intervention and change in PCI as a percentage of all coronary interventions between 1995 and 2003.

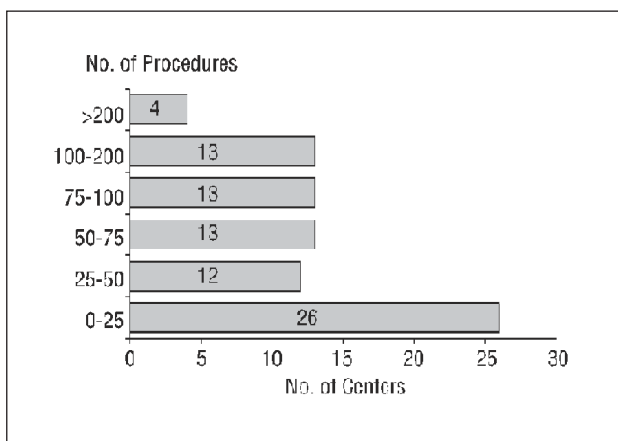


Fig. 9. Distribution of centers performing percutaneous coronary interventions in patients with acute myocardial infarction.

admitted to hospital with AMI in Spain.^{17,18} Eighty-one centers carried out PCI in patients with AMI. The average number of interventions per center was 75, but variability was high (Figure 9)—17 centers performed more than 100 PCI during AMI and 38% of centers carried out less than 50 (slightly less than the 59% of centers that performed fewer than 50 PCI during acute AMI in 2002).¹²

Figure 10 shows the number of PCI done in patients with acute myocardial infarction per million inhabitants by autonomous region. A total of 605 PCI were

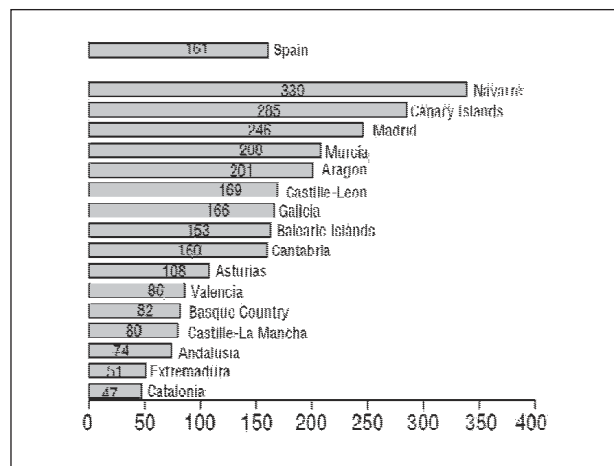


Fig. 10. Distribution of percutaneous coronary interventions per million inhabitants in patients with acute myocardial infarction by Spanish autonomous region.

undertaken during cardiogenic shock, corresponding to 12.7% of all cases of AMI.

Stents

As in previous years, stents were used in almost all procedures. Overall, 37 559 stent procedures were undertaken, that is, 92.5% of all interventions. The ratio of stents per procedure was 1.53 (compared to 1.48 in 2002) and the number of stents implanted was 57 778, of which 11 699 were drug-eluting stents, corresponding to 20.24% of all stents implanted. The difference in percentage use of drug-eluting stents varied greatly (from 44.1% to 9.8%) according to Spanish autonomous region (Figure 11).

Finally, direct stenting, that is, without balloon predilatation, was done in 21 262 procedures, corresponding to 42.7% of all stent placements. Stents without predilatation were used in 30.8% of all stent procedures, a percentage notably lower than the 43.2% reported for 2002. The decrease in direct stenting could be partly explained by the introduction of drug-eluting stents. Table 1 shows the number of stents implanted over recent years.

Other Percutaneous Interventional Devices

Directional atherectomy almost disappeared in 2003—only 3 procedures were done in 3 centers. Rotational atherectomy was done in 349 patients in 26 centers, a reduction in use of 23% compared to 2002 (Table 2).

Among the other PCI devices, of note was the increased use of cutting balloons—used in 1079 patients (an increase), thrombus aspiration techniques—used in 743 procedures (an increase of 49%), and distal embolization protection devices—used in 200 patients (the same number as in 2002). Alcohol-induced septal branch occlusion was undertaken in 21 patients and

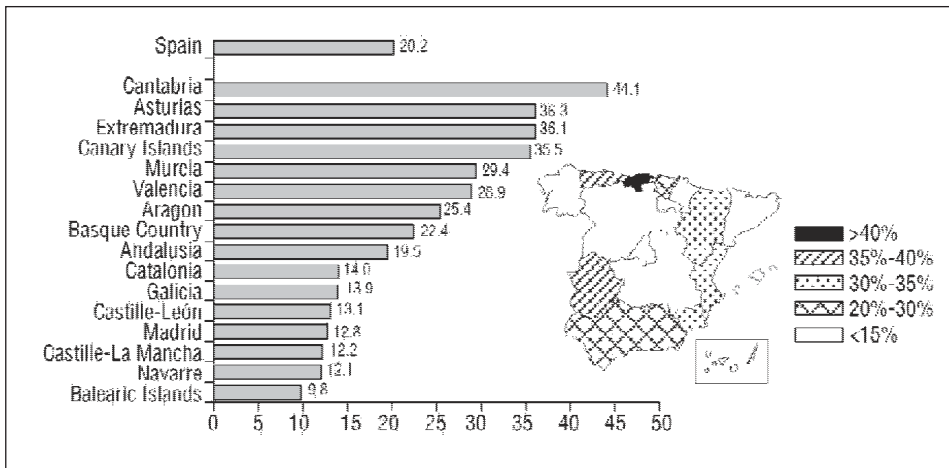


Fig. 11. Distribution of drug-eluting stents as a percentage of all stents implanted by Spanish autonomous region.

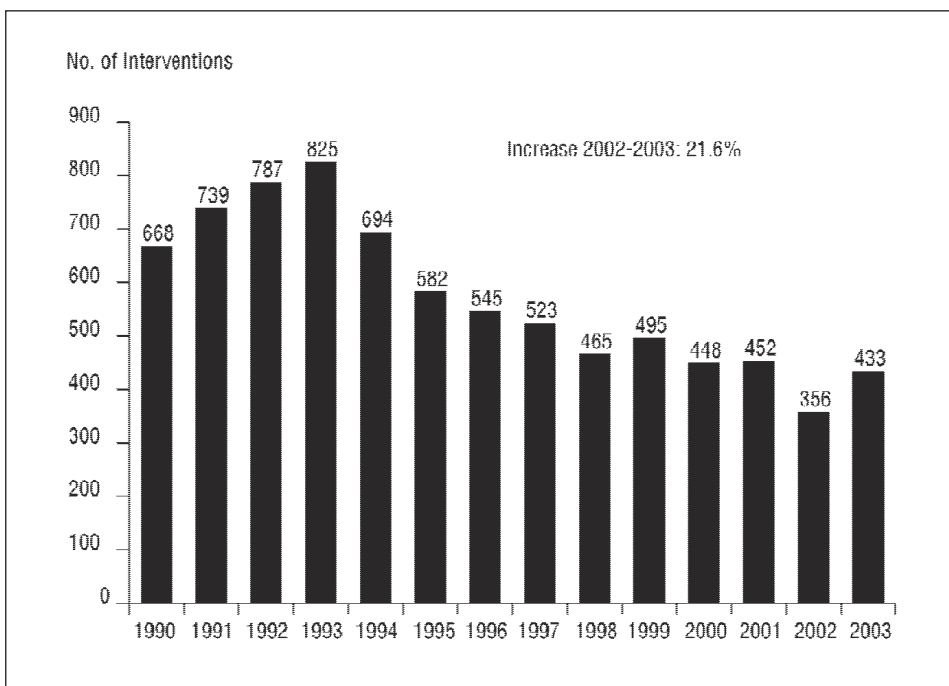


Fig. 12. Change in the number of mitral valvuloplasty procedures between 1990 and 2003.

fistula embolization in 11 patients. Finally, there was a marked decrease of 41% in brachytherapy with beta radiation during 2003 (performed in 71 patients) compared to 2002 (performed in 120 patients). Seventy-nine restenotic lesions and 3 *de novo* lesions were treated, all successfully and without complications.

Noncoronary Interventions in Adults

During 2003, 463 valvuloplasties were undertaken in adults in 53 centers—an increase of 17% compared to 2002. A large part of this increase was due to the increase in mitral valvuloplasties (which increased from 356 to 433—an increase of 21.6% [Figure 12]). In addition, 9 aortic valvuloplasties and 21 pulmonary valvuloplasties were performed.

Percutaneous devices were used to close atrial septal defects in 266 patients—an 86% increase compared to the previous year. Interventions were successful in 91.3% of the patients, failed without complications in 7.9% and failed with complications in 0.8% of the patients. Further 58 procedures were performed in adult patients with congenital heart disease. Other noncoronary percutaneous interventions included treatment of 48 renal arteries, 20 aortic coarctations, 6 abdominal aortic aneurysms, 17 thoracic aortic aneurysms, and 54 percutaneous myocardial stem cell implantations.

Interventions in Pediatric Patients

A total of 1108 interventional procedures were done in children in 21 centers—an increase of 13.3%

TABLE 1. Implantation of Coronary Stents (1996-2003)

	1996	1997	1998	1999	2000	2001	2002	2003
Centers, n	66	69	70	80	87	94	93	102
Procedures, n	3418	7104	14 497	17 783	22 580	27 586	31 871	37 559
Units implanted, n	8873	14 170	19 378	22 946	29 504	39 356	47 249	57 778
Stents/procedure, n	1.26	1.24	1.34	1.3	1.3	1.43	1.48	1.53
Patients with stents/total PCI, n	27.6	47.3	61.5	71.9	77.3	88.1	91.7	92.5
Drug-eluting stents, n	-	-	-	-	-	-	1.906	11 699
Drug-eluting stents, %	-	-	-	-	-	-	4,1	20.2
Direct stenting, n	-	-	-	-	8778	11 280	13 768	11 577
Direct stenting, %	-	-	-	-	38.9	40.9	43.2	30.8

TABLE 2. Rotational Atherectomy, Directional Atherectomy, Cutting Balloons, Thrombectomy, and Distal Protection (1995-2003)

	1995	1996	1997	1998	1999	2000	2001	2002	2003
Rotational atherectomy									
Procedures	330	367	554	549	473	461	445	426	349
Centers	23	18	33	36	32	28	33	27	26
Directional atherectomy									
Procedures	186	96	92	81	52	57	114	19	3
Centers	23	12	8	6	5	4	9	4	3
Cutting balloon	-	-	-	71	93	176	423	638	1079
Thrombectomy	-	-	6	10	4	108	329	499	743
Distal protection	-	-	-	-	-	10	43	200	200

compared to 2002. These included 364 dilatations, 133 closures of atrial septal defects, and 183 ductal closures. Figure 13 shows the most frequent procedures.

CONCLUSIONS

One of the most important tasks of the Working Group on Catheterization and Interventional Cardiology of the Spanish Society of Cardiology is to compile

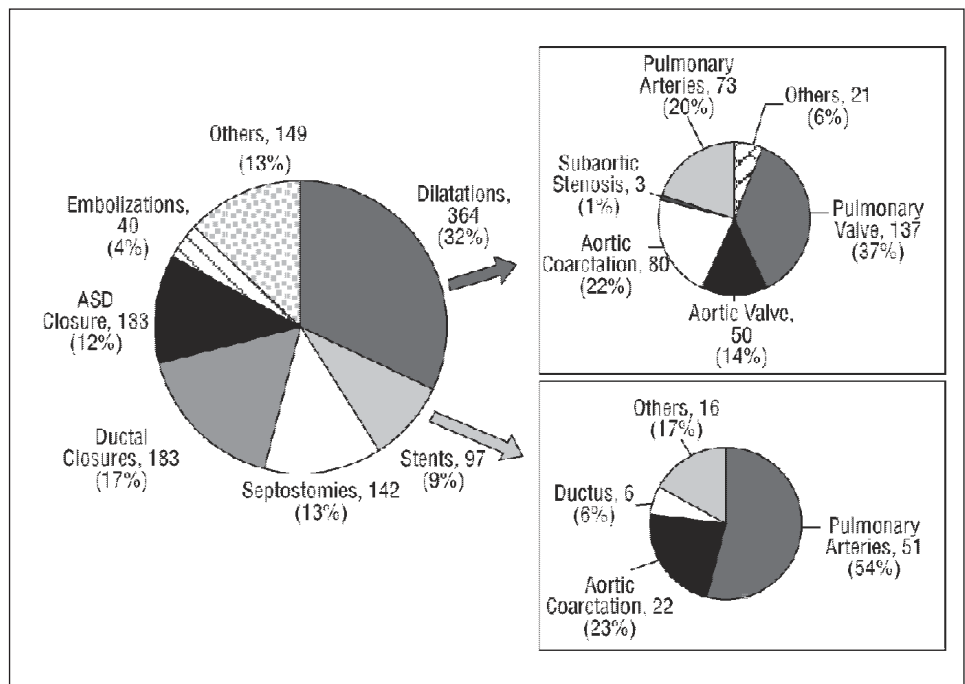


Fig. 13. Distribution of pediatric interventions. ASD indicates atrial septal defect.

and publish the Annual Registry of Cardiac Catheterization and Coronary Interventions. Both the board and the members of the Working Group consider that it is crucially important for health professionals, health authorities and the general public to be aware of the findings of this registry of activity. The findings of this registry provide a close approximation to the clinical reality of this important aspect of cardiovascular disease management and may help to better assign health resources in this field. During 2003, an increase was seen not just in the absolute diagnostic and therapeutic activity during infarction, but also in the ratio of PCI to coronary angiography and the ratio of PCI in AMI to general PCI. In 2003, the ratio of PCI to coronary angiography and the percentage of PCI performed during the diagnostic procedure—already high compared to other European countries in previous years—have increased. Even so, the resources available, and the diagnostic procedures and interventions undertaken, are clearly lower than the most advanced European countries. Although the differences with some European countries are noteworthy, more striking still are the contrasts in both diagnostic activity and in different therapeutic interventions among autonomous regions of Spain. Despite the efforts to ensure equal health care coverage throughout the country, some autonomous regions still have figures for coronary angiography, interventions and interventions during AMI that are clearly below the average for the rest of Spain.

Coronary stenting accounted for 92.5% of the procedures. Only 20.4% of the implanted stents were of the drug-eluting type, perhaps because this was the first year in which such devices were available in Spain. The percentage use ranged from 44.1% to 9.8% among the different autonomous regions. Use of atherectomy has continued to decline, and directional atherectomy has almost disappeared in Spain. In contrast, thrombectomy has increased substantially for the second year running, with a percentage decrease in distal embolization protection devices.

Finally, an increase in the number of both mitral valvuloplasties and of percutaneous closure of atrial septal defects was seen. Interventional activity in pediatric patients increased by 13.3%.

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ANNEX 1. Questionnaire for the Registry of Activity of the Working Group on Cardiac Catheterization and Interventional Cardiology-2003

1. DEMOGRAPHIC DATA

Hospital:
 Address:
 Zip code:
 Province:
 Telephone:
 Extension:
 Fax:
 E-mail:
 Contact physician (responsible for the data):

2. LABORATORY DATA

Number of laboratories:

Conventional:

Digital:

Number of staff physicians:

Number of staff physicians who do PCI:

Number of nurses:

Number of radiology technicians:

24-hour emergency service: Yes: No:

Cardiovascular surgery available at the center: Yes: No:

Activity database available: Yes: No:

3. DIAGNOSTIC ACTIVITY:

Total number of diagnostic procedures

Number of coronary angiograms:

Number of studies in patients with valve disease:

Number of endomyocardial biopsies:

Number of adults with congenital disease:

Number of pediatric patients:

Other:

Number of procedures with radial approach:

The combination of left and right cardiac catheterization is considered as a single procedure regardless of whether it is accompanied by a coronary angiogram. A complete study in a patient with valve disease who also has a coronary angiogram is considered a single study in a patient with valve disease. A coronary angiogram alone in a patient with valve disease is to be counted as a coronary angiogram.

A biopsy in a patient with a coronary angiogram is a single procedure and should be counted as a biopsy so as not to interfere with the ratio of coronary angiograms to PCI

4. OTHER DIAGNOSTIC CORONARY STUDIES

Quantitative coronary angiogram: Yes: No:

Number of echocardiographic studies:

Number of studies with pressure wire:

Number of studies with Doppler flow wire:

These coronary studies are not counted separately within the total number of procedures. For example, a diagnostic coronary angiogram accompanied by a study with coronary pressure wire is a single diagnostic procedure. A PCI with IVUS or a coronary pressure wire is a single interventional procedure.

5. CORONARY INTERVENTION ACTIVITY

Total number of procedures*:

Number of multivessel procedures:

Number of procedures at the same time as diagnostic procedures:

Number of procedures with treatment of at least one restenotic lesion:

Number of procedures with at least one saphenous vein graft:

Number of procedures with at least one mammary artery graft:

Number of procedures in the left anterior descending artery:

Protected:

Unprotected:

Number of procedures with balloon intervention only:

Number of procedures with radial approach:

Number of procedures with glycoprotein IIb/IIIa inhibitors:

Abciximab: Eptifibatide: Tirofiban:

Number of procedures with ionic contrast

Number of procedures with nonionic contrast:

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ANNEX 1. Questionnaire for the Registry of Activity of the Working Group on Cardiac Catheterization and Interventional Cardiology-2003 (Continued)

Outcome:

- Total number of successful procedures:
- Total number of failed procedures without complications:
- Total number of procedures with major complications:
- Nonfatal AMI:
- Emergency surgery (24 h):

Hospital death:

*A therapeutic procedure is considered to be attempted treatment of one or more coronary lesions, provided an attempt is made to introduce the guidewire into a coronary artery. This is counted as a single procedure regardless of how many devices are used in the same procedure (stent, IVUS, atherectomy, etc) or the number of arteries treated.

6. SUPPORT METHODS FOR INTERVENTIONAL PROCEDURES

- Number of procedures with intraaortic balloon counterpulsation:
- Number of procedures with percutaneous extracorporeal circulation:

7. INTERVENTIONAL ACTIVITY IN ACUTE MYOCARDIAL INFARCTION

Total number of procedures related to AMIa:

- Primary PCI^a:
- Rescue PCI^b:
- Facilitated PCI:
- Immediate facilitated PTCA^c:
- Deferred facilitated PTCA^d:

Outcome:

- Successful without complications:
- Major complications:
- Emergency surgery:
- Hospital death:
- Number of patients in cardiogenic shock (within 24 hours of onset of AMI):

Outcome:

- Successful without complications:
- Major complications:
- Emergency surgery:
- Death:
- Number of stent procedures:
- Number of procedures with balloon intervention only:
- Number of procedures with glycoprotein-IIb/IIIa inhibitors:
- Number of procedures with thrombus aspiration:
- Number of procedures with distal embolization protection:

^aPTCA performed during acute phase of AMI (first 12 h) without any prior thrombolytic therapy.

^bPTCA performed during acute phase of AMI after thrombolytic therapy due to clinical suspicion of reperfusion failure with thrombolytic therapy.

^cPCI performed electively in the first 3 hours after administration of thrombolytic therapy and a IIb/IIIa platelet antagonist.

^dPCI performed electively between 3 and 24 hours after successful administration of thrombolytic therapy and a platelet IIb/IIIa antagonist.

8. CORONARY STENTING

- Total number of procedures:
- Total number of stents implanted:
- Total number of stents implanted without predilatation*:
- Total number of drug-eluting stents:

*All lesions in one session treated without predilatation.

9. OTHER DEVICES PROCEDURES:

- Total number of procedures:
- Directional atherectomy:
- Rotational atherectomy:
- Other types of atherectomy:
- Coronary laser:
- Laser guidewire:
- Transmyocardial laser:
- Radiofrequency balloon:
- Ultrasound therapy:

(Continues on next page)

ANNEX 1. Questionnaire for the Registry of Activity of the Working Group on Cardiac Catheterization and Interventional Cardiology-2003 (Continued)

Cutting balloon:
 Other special balloons (with protrusions, guidewire):
 Thrombus aspiration techniques:
 Distal embolization protection devices:
 Percutaneous closure devices:
 With collagen:
 With suture:
 Others:
 Septal branch occlusion:
 Embolization of fistulas:
 Percutaneous perfusion of stem cells:

Stenting of the aortic artery:
 – Abdominal
 – Thoracic

Dilatation of renal arteries

10. BRACHYTHERAPY
 Total number of procedures:
 Beta radiation:
 Gamma radiation:

Total number of lesions:
 De novo:
 Restenotic:

Initial outcome:
 Total number of successful procedures:
 Total number of mayor complications:
 Death:
 Nonfatal AMI:
 Surgery:

11. INTERVENTIONS IN ADULT PATIENTS WITH VALVE DISEASE

Percutaneous mitral commissurotomy:
 Total number of procedures:
 Outcome
 Successful:
 Complications:
 Cardiac tamponade:
 Severe mitral regurgitation:
 Stroke:
 Death:

Aortic valvuloplasty:
 Total number of procedures:
 Outcome
 Success:
 Complications:
 Severe aortic regurgitation:
 Stroke:
 Death:

Pulmonary valvuloplasty:
 Total number of procedures:
 Outcome
 Success:
 Complications:
 Cardiac tamponade:
 Death:

12. PROCEDURES IN PATIENTS WITH CONGENITAL HEART DISEASE

Atrial septal defect closures:
 Number of procedures:
 Success:
 Failure without complications:

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ANNEX 1. Questionnaire for the Registry of Activity of the Working Group on Cardiac Catheterization and Interventional Cardiology-2003 (Continued)

Complications:
 Death:
 Others:
 Aortic coarctation:
 Other procedures in adults with congenital heart disease (specify):
13. THERAPEUTIC PROCEDURES IN PEDIATRIC PATIENTS
 Dilatations:
 Pulmonary valve:
 Aortic valve:
 Aortic coarctation:
 Subaortic stenosis:
 Pulmonary arteries:
 Other dilatations:
 Stenting of:
 Pulmonary arteries:
 Aortic coarctation:
 Ductus:
 Other sites:
 Atrial septostomy in:
 ICU:
 Catheterization laboratory:
 Ductal closure:
 Atrial septal defect closure:
 Embolizations:

Others:

14. OBSERVATIONS AND COMMENTS:

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ANNEX 2. Register of Activity of the Working Group on Cardiac Catheterization and Interventional Cardiology: Participating Laboratories in 2003

ANDALUSIA	Hospital Universitario Virgen Macarena
<i>Cádiz</i>	ARAGON
Clínica Nuestra Señora de la Salud	<i>Zaragoza</i>
Hospital Universitario Puerta del Mar	Hospital Clínico Universitario
Hospital Universitario de Puerto Real	Hospital Universitario Miguel Servet
<i>Córdoba</i>	CANARY ISLANDS
Hospital Universitario Reina Sofía y Cruz Roja	<i>Las Palmas</i>
<i>Granada</i>	Clínica San Roque
Hospital Universitario Virgen de las Nieves	Hospital de Gran Canaria Dr. Negrín
<i>Huelva</i>	Hospital Universitario Insular de Gran Canaria
Hospital Juan Ramón Jiménez	<i>Tenerife</i>
<i>Jaén</i>	Complejo Hospitalario Nuestra Señora de la Candelaria
Complejo Hospitalario Ciudad de Jaén	Hospital Universitario de Canarias
<i>Málaga</i>	Hospiten Rambla
Clínica El Ángel	CANTABRIA
Clínica Parque San Antonio	Hospital Universitario Marqués de Valdecilla
Clínica Santa Elena	CASTILLE-LEON
Complejo Hospitalario Carlos Haya	<i>León</i>
Hospital Costa del Sol Marbella	Hospital de León
Hospital Universitario Virgen de la Victoria	<i>Salamanca</i>
<i>Sevilla</i>	Hospital Universitario de Salamanca
Hospital Universitario Virgen del Rocío	

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**ANNEX 2. Register of Activity of the Working Group on Cardiac Catheterization and Interventional Cardiology:
Participating Laboratories in 2003 (Continued)**

<i>Valladolid</i>	<i>Valencia</i>
Hospital Campo Grande	Clinica Casa de Salud
Hospital Universitario de Valladolid	Clínica Quirón
CASTILLE-LA MANCHA	Hospital Clínico Universitario de Valencia
<i>Albacete</i>	Hospital de la Ribera. Alzira
Ibérica de Diagnóstico y Cirugía	Hospital General Universitario de Valencia
<i>Guadalajara</i>	Hospital Nueve de Octubre. GESNOU, S.A.
Hospital General de Guadalajara	Hospital Universitario Dr. Peset
<i>Toledo</i>	Hospital Universitario La Fe
Hospital Virgen de la Salud	Hospital Virgen del Consuelo
CATALONIA	EXTREMADURA
<i>Barcelona</i>	<i>Badajoz</i>
Centre Cardiovascular Sant Jordi	Hospital Universitario Infanta Cristina
Centro Médico Teknon	<i>Cáceres</i>
Ciutat Sanitària i Universitària de Bellvitge, L'Hospitalet de Llobregat	Clínica Virgen de Guadalupe
Clínica Corachan	GALICIA
Clínica La Alianza. ANGIOCOR Clínica Quirón	<i>La Coruña</i>
Clínica Sagrada Familia, UCRISA	Complejo Hospitalario Juan Canalejo
Hospital Clínico i Provincial de Barcelona	Complejo Hospitalario Universitario de Santiago de Compostela
Hospital de Barcelona	Instituto Médico-Quirúrgico San Rafael
SCIAS Hospital de la Santa Creu i Sant Pau	Sanatorio Quirúrgico Modelo
Hospital del Mar	<i>Pontevedra</i>
Hospital General de Catalunya	Hospital de Meixoeiro, MEDTEC, Vigo
Hospital General Vall d'Hebron	BALAERIC ISLANDS
Hospital Universitario Germans Trias i Pujol, Badalona	Clínica Rotger
<i>Girona</i>	Hospital Universitario Son Dureta
Hospital Dr. Josep Trueta	Policlínica Miramar
<i>Tarragona</i>	Policlínica Nuestra Señora del Rosario
Hospital Juan XXIII	BASQUE COUNTRY
MADRID AUTONOMOUS REGION	<i>Álava</i>
Centro Médico Zarzuela	Hospital Txagorritxu, Vitoria
Clínica La Luz	<i>Guipúzcoa</i>
Clínica Moncloa	Policlínica Guipúzcoa, San Sebastián
Clínica Montepíncipe	<i>Vizcaya</i>
Clínica Nuestra Señora de América	Clínica V. San Sebastián, Bilbao
Clínica Ruber Internacional	Hospital de Basurto, Bilbao
Fundación Hospital Alcorcón	Hospital de Cruces, Baracaldo
Fundación Jiménez Díaz	Hospital de Galdakao
Hospital Clínico San Carlos-Complejo Hospitalario	ASTURIAS
Hospital de la Princesa	Centro Médico de Asturias
Hospital General Universitario Gregorio Marañón	Hospital Central de Asturias
Hospital Militar Gómez Ulla	MURCIA
Hospital Puerta de Hierro	Hospital Universitario Virgen de la Arrixaca
Hospital Ramón y Cajal	Sanatorio San Carlos
Hospital Ruber Internacional	Clínica Nuestra Señora de la Vega
Hospital Universitario 12 de Octubre	CENTERS WITH SEPARATE PEDIATRIC ACTIVITY
Hospital Universitario La Paz	<i>Barcelona</i>
Instituto de Cardiología de Madrid	Hospital Sant Joan de Déu
Sanatorio La Milagrosa	Hospital Vall d'Hebron Infantil
NAVARRRE AUTONOMOUS REGION	<i>Madrid</i>
Clínica Universitaria de Navarra	Hospital La Paz Infantil
Hospital de Navarra	Hospital Ramón y Cajal
VALENCIAN AUTONOMOUS REGION	Hospital 12 de Octubre
<i>Alicante</i>	<i>Málaga</i>
Hospital Clínica Benidorm	Hospital Materno Infantil, Complejo Carlos Haya
Hospital General Universitario de Alicante	<i>Sevilla</i>
Hospital de San Juan	Hospital Virgen del Rocío
Sanatorio Perpetuo Socorro	<i>Valencia</i>
<i>Castellón</i>	Hospital Universitario La Fe
Hospital General de Castellón	