

## Diagnosis and interventional treatment in patients of the General Calixto Garcia Hospital

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### ARTICLE INFORMATION

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#### Competing interests

The authors declare no competing interests

#### Acronyms

**CAD:** coronary artery disease

**CSA:** chronic stable angina

**CVD:** cardiovascular diseases

**NSTE-ACS:** non-ST-segment elevation acute coronary syndrome

**PCI:** percutaneous coronary intervention

**PTCA:** percutaneous transluminal coronary angioplasty

**STE-ACS:** ST segment elevation acute coronary syndrome

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### ABSTRACT

**Introduction:** The diagnosis and interventional treatment is a distance service in the developing world, in hospitals that do not have interventional cardiology services. This is the case of the Calixto Garcia Hospital, where patients are referred to two nearby hospitals.

**Objectives:** To characterize the interventional treatment of patients admitted to the coronary care ward of the above hospital.

**Method:** A descriptive cross-sectional study was conducted from January 2003 to December 2009. The medical records and the databases of the Cardiac Catheterization and Interventional Cardiology Departments from the Institute of Cardiology and Cardiovascular Surgery and the Carlos J. Finlay Military Hospital were reviewed.

**Results:** 841 coronary angiograms were performed. There was a predominance of males with 559 cases (66.5 %), the mean age was 58 years, the most common risk factors included hypertension 613 (72.9%), smoking 277 (32.9%), dyslipidemia 164 (19.5%) and diabetes mellitus 138 (16.4%). Angiographically significant lesions were found in 65% of patients; 272 patients (32.3%) had 1-vessel disease and 276 (32.8%) had 2 and 3-vessel disease. A total of 327 (38.9%) coronary angioplasties were performed, predominantly in men 239 (73%), with a similar behavior of the risk factors. The most common clinical diagnoses in this group included acute coronary syndrome without ST segment elevation 145 (44.3%), chronic stable angina 106 (32.4%) and acute coronary syndrome with ST segment elevation 61 (18.7 %). The most affected and treated artery was the left anterior descending artery. The 3.0 x 18 mm metal stent Apolo was the most used stent. The procedure was successful in 95.7 % of cases.

**Conclusions:** Percutaneous treatment is a valid option for patients admitted to centers that do not have the interventional cardiology service.

**Key words:** Coronary angioplasty, Coronary angiography, Percutaneous coronary intervention, Coronary artery disease

## **Diagnóstico y tratamiento intervencionista en los pacientes del Hospital General Calixto García**

### **RESUMEN**

**Introducción:** El diagnóstico y tratamiento intervencionista es una modalidad a distancia en el mundo desarrollado, en los hospitales que no cuentan con servicio de Cardiología Intervencionista. Este es el caso del Hospital Calixto García, desde donde se remiten los pacientes a dos hospitales cercanos.

**Objetivo:** Caracterizar el tratamiento intervencionista de los pacientes ingresados en la sala de cuidados coronarios del mencionado hospital.

**Método:** Se realizó un estudio descriptivo y transversal desde enero de 2003 hasta diciembre de 2009, se revisaron las historias clínicas y la base de datos de los Servicios de Hemodinámica y Cardiología Intervencionista del Instituto de Cardiología y Cirugía Cardiovascular, y del Hospital Militar Carlos J. Finlay.

**Resultados:** Se realizaron 841 coronariografías, predominó el sexo masculino con 559 casos (66,5 %), edad media de 58 años, los factores de riesgo más frecuentes fueron: hipertensión arterial 613 (72,9 %), tabaquismo 277 (32,9 %), dislipidemia 164 (19,5 %) y diabetes mellitus 138 (16,4 %). El 65 % de los pacientes tenía lesiones angiográficamente significativas, 272 (32,3%) enfermedad de 1 vaso y 276 (32,8 %) enfermedad de 2 y 3 vasos. Se realizaron 327 (38,9 %) angioplastias coronarias, predominantemente en hombres 239 (73 %), con igual comportamiento de los factores de riesgo. Los diagnósticos clínicos más frecuentes en este grupo fueron: síndrome coronario agudo sin elevación del segmento ST 145 (44,3 %), angina estable crónica 106 (32,4 %) y síndrome coronario agudo con elevación del segmento ST 61 (18,7 %). La arteria más afectada e intervenida fue la descendente anterior. El *stent* metálico Apolo de 3,0 x 18 mm fue el más utilizado. El procedimiento fue exitoso en el 95,7 % de los casos.

**Conclusiones:** El tratamiento percutáneo es una opción válida para los pacientes ingresados en centros que no dispongan de servicio de cardiología intervencionista.

**Palabras clave:** Angioplastia coronaria, Coronariografía, Intervencionismo coronario percutáneo, Enfermedad coronaria

### **INTRODUCTION**

Cardiovascular diseases are currently the leading cause of death in industrialized countries, and in the developing countries they are also expected to be the leading cause by the year 2020<sup>1</sup>. Among them, coronary artery disease (CAD) is the most prevalent manifestation, having high morbidity and mortality rates.

In 1990, cardiovascular diseases (CVD) accounted for 12.9 % of the global mortality rate; this figure increased to 30.4 % in 1999. In the U.S. alone, 1.5 million people suffer from heart attacks every year, and nearly 500 000 are fatal<sup>2</sup>. They account for about 30 % of all deaths in Latin America and the Caribbean, and there is still a high mortality rate in ischemic heart disease in many countries. The MONICA study, conducted by the World Health Organization (WHO) in 37

populations from 21 countries, indicates that the death rate of the disease varies considerably between countries; a mean of 49.0 % was obtained among men, and 53.8 % among women<sup>3</sup>.

Published data from surgical and percutaneous interventional procedures in the world confirm that percutaneous transluminal coronary angioplasty (PTCA) exceeds the number of coronary surgery procedures. In 1995, a total of 700.424 coronary angioplasties were performed in the world (127 per million inhabitants), as well as 583.228 coronary artery bypass surgery (106 per million inhabitants).

Data from the registry of the Latin American Society of Interventional Cardiology (SOLACI, by its acronym in Spanish) indicate that from 1998 to 2004 the data from 20 countries were recorded, corresponding to

618 cardiac catheterization labs with 1.278 interventional cardiologists. One million 329.865 procedures were performed over these six years, including 326.229 diagnostic procedures.

In Cuba, ischemic heart disease is also the leading cause of death and accounts for over 30% of the global mortality rate, mostly attributed to acute myocardial infarction, causing more than 10.000 deaths per year, with a higher incidence in men. In the last decade, the rates per 100.000 inhabitants have not undergone major changes<sup>4</sup>.

In our country, there has been an increase in interventional procedures over the last 7 years (2003-2009), with 1.022 procedures in 2003 and 2.115 in 2009.

The diagnosis and interventional treatment is a distance service in the developing world, in hospitals that do not have interventional cardiology services. Despite not having a catheterization service, the Cardiology Department of the Calixto García Hospital has conducted 1.168 interventional procedures until December 2009, in hospital where this service is available [The Institute of Cardiology and Cardiovascular Surgery (ICCCV, for its acronym in Spanish) and the Carlos J. Finlay Military Hospital], with a slight increase in recent years.

The present study is aimed at characterizing the interventional treatment in patients admitted with a diagnosis of some type of acute or chronic ischemic disease.

**METHOD**

A descriptive cross-sectional study was conducted. The sample consisted of patients over 18 years of age who were admitted with diagnoses of chronic stable angina (CSA), non-ST-segment elevation acute coronary syndrome (NSTEMI-ACS) and ST segment elevation acute coronary syndrome (STEMI-ACS) and were treated at the coronary care ward of the General Calixto García University Hospital from January 2003 to December 2009, undergoing diagnostic or therapeutic percutaneous coronary intervention (PCI) at the Cardiac Catheterization and Interventional Cardiology Units of the ICCCV and the Carlos J. Finlay Military Hospital.

The data including the demographic and clinical variables, coronary risk factors, number of diseased vessels, sick/treated artery, results and mortality during this procedure were collected with the use of medical records and the databases of both services.

**Inclusion criteria**

Patients admitted to the above hospital with a diagnosis of CSA, NSTEMI-ACS and STEMI-ACS who were referred for PCI.

**Exclusion Criteria**

Patients in whom the coronary reperfusion procedure was not PCI.

Quantitative variables are expressed as mean values and qualitative or categorical variables as mean and relative frequencies. The results are shown

**Table 1.** Distribution of interventional procedures by age and sex.

Age (years)	Coronary angiography				PTCA			
	Female	Male	Total	%	Female	Male	Total	%
20 - 29	1	3	4	0,5	0	0	0	0
30 - 39	12	19	31	3,7	4	10	14	4,3
40 - 49	59	98	157	18,7	12	43	55	16,8
50 - 59	75	197	272	32,3	23	81	104	31,8
60 - 69	96	191	287	34,1	35	86	121	37
≥ 70	39	51	90	10,7	14	19	33	10,1
Total	282	559	841	100	88	239	327	100

Source: Medical records and databases of the Cardiac Catheterization and Interventional Cardiology Departments.

**Table 2.** Distribution of interventional procedures according to the risk factors.

Risk factor	Coronary angiography	%	PTCA	%
Diabetes mellitus	138	16,4	62	18,9
HT	613	72,9	239	73,1
Smoking	277	32,9	141	43,1
Dyslipidemia	164	19,5	67	20,5
Obesity	103	12,2	32	9,8

Source: Medical records and databases of the Cardiac Catheterization and Interventional Cardiology Departments.

**Table 3.** Distribution of interventional procedures according to clinical diagnosis.

Clinical diagnosis	Coronary angiography	%	PTCA	%
STE-ACS	102	12,1	61	18,7
NSTE-ACS	328	39,0	145	44,3
CSA	382	45,4	106	32,4
Valvular heart disease	17	2,0	3	0,9
Others	12	1,4	12	3,7
Total	<b>841</b>	<b>100</b>	<b>327</b>	<b>100</b>

Source: Medical records and databases of the Cardiac Catheterization and Interventional Cardiology Departments.

through tables and charts.

The interventional procedure was performed with the informed consent of the patient.

## RESULTS

A total of 841 coronary angiograms were performed. There was a predominance of males with 559 patients (66.5%); the mean age was 58 years, ranging from 25 to 90 years (Table 1). The most common risk factors (Table 2) were hypertension (HT) with 613 patients (72.9%) and smoking with 277 (32.9%), followed by dyslipidemia with 164 (19.5%) and diabetes mellitus with 138 (16.4%), in descending order.

The diagnoses that led to the procedure (Table 3) were: CSA, 382 cases (45.4%); NSTE-ACS, 328 (39%); STE-ACS, 102 (12.1%); valvular heart disease, 17 (2%) and others with 12 cases (1.4 %). No angiographically signi-

ficant stenosis was found in 34.8 % of patients, whereas 276 (32.8 %) had multivessel disease (Table 4).

The most affected artery and therefore the most treated one was left anterior descending artery (Table 5). The 3.0 x 18 mm metal stent Apolo was the most commonly used stent. Mortality rate during the diagnostic procedure was 0.4 %.

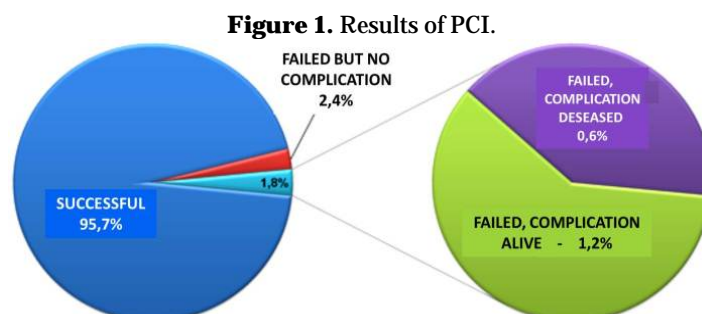
A total of 327 PTCA were performed (38.9%). There was a predominance of males with 239 patients (73%) (Table 1). As in coronary angiography, the main risk factors were hypertension with 239 patients (73.1 %), and smoking 141 (43.1%) (Table 2). The procedure was successful in 95.7 % of cases (Figure 1).

Figure 2 shows the evolution of interventional cardiology at the coronary care ward of the Calixto García Hospital, in spite of using distance catheterization and interventional cardiology services.

**Table 4.** Distribution of interventional procedures according to the number of diseased vessels.

Disease	Coronary angiography	%	PTCA	%
1 vessel	272	32,3	272	83,2
2 vessel	158	18,8	49	14,9
3 vessel	118	14,0	6	1,8
ECAWASL	293	34,8	0	0
Total	<b>841</b>	<b>100</b>	<b>327</b>	<b>100</b>

Abbreviations: Epicardial coronary arteries without angiographically significant lesions (ECAWASL)



Source: Medical records and databases of the Cardiac Catheterization and Interventional Cardiology Departments.

**Table 5.** Distribution of interventional procedures according to the affected/treated artery\*.

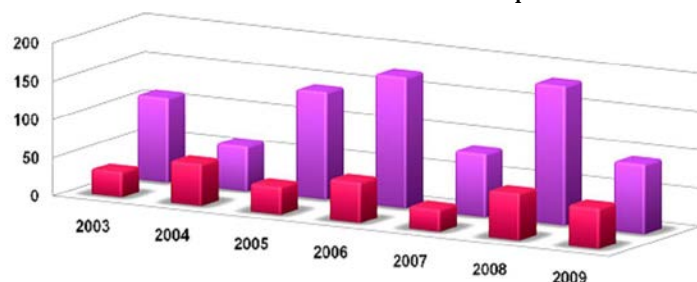
Artery	Coronary angiography	%	PTCA	%
LMCA	37	4,4	7	2,1
LAD	263	31,3	165	50,5
Cx	177	21,0	57	17,4
RCA	248	29,5	143	43,7

Source: Medical records and databases of the Cardiac Catheterization and Interventional Cardiology Departments.

\* Percentages were calculated based on the total number of coronary angiographies (841) and PTCA (327).

Abbreviations. LMCA: left main coronary artery, LAD: left anterior descending artery, Cx: circumflex artery, RCA: right coronary artery.

**Figure 2.** Evolution of Interventional Cardiology at the Coronary Care Ward of the Calixto Garcia Hospital.



	2003	2004	2005	2006	2007	2008	2009
■ PTCA	34	56	37	54	30	62	54
■ CA	111	59	141	172	83	183	92

Source: Medical records and databases of the Cardiac Catheterization and Interventional Cardiology Departments. Abbreviations. CA: Coronary angiography

## DISCUSSION

The study gathers the sociodemographic characteristics of the patients, showing predominance of males, with a mean age of 58 years, which matches the results found in national studies<sup>5</sup> that assess the trend of population aging in Cuba.

As in other countries, hypertension in Cuba has become the most common reason for medical consultation and is the cause of the increase in cerebrovascular and cardiovascular morbidity and mortality shown in numerous epidemiological, clinical, pathological and experimental studies<sup>6</sup>. Particularly isolated systolic blood pressure  $\geq 140$  mmHg significantly increases the risk of nonfatal myocardial infarction and cardiovascular death in samples of the general population and

in seemingly low-risk groups<sup>7</sup>. The behavior of this risk factor is related to unhealthy life styles such as physical inactivity, excessive intake of salt, alcohol consumption and high calorie intake that leads to obesity; and this could be the answer to its high prevalence<sup>7</sup>.

Smoking is an independent cardiovascular risk factor and the most important preventable cause of CVD. Nicotine alters the activity of the central nervous system and upsets the levels of circulating catecholamines, increases heart rate, contractility and oxygen consumption. It also activates the phospholysis, with increased glucose levels; lipolysis, with increased release of free fatty acids; and increases platelet aggregation. All this has been proven as a result of the abundant clinical, experimental and epidemiological evidence<sup>8</sup>. However, the mechanisms to control this habit are insufficient. The WHO estimates that smoking will cause 10 million premature deaths annually by 2030, of which nearly 7 million will occur in Latin-American countries<sup>9</sup>.

Cigarette smoking remains the most important modifiable risk factor of ischemic heart disease and the leading cause of preventable death in the United States, which is responsible for over 400 000 deaths per year<sup>10</sup>.

The role of hypercholesterolemia in the genesis of the atheromatous plaque is well known; therefore, it is worrying its high prevalence in many of the studied populations. Several studies such as the Multiple Risk Factor Intervention Trial (MRFIT) and the Framingham study, have confirmed the close relationship between high cholesterol levels and the risk of premature death from CVD<sup>11</sup>. Recently, another study conducted in Latin America has also demonstrated the importance of hypercholesterolemia as a cardiovascular risk factor<sup>12</sup>.

Diabetes mellitus is another risk factor associated with the occurrence of CVD. In this study, it showed a similar percentage to those found in previous national and international studies<sup>12,13</sup>. More recent studies<sup>14</sup> show, generally, prevalence levels from 6.7 to 18.3 %, although different diagnostic criteria and inclusion criteria according to age make difficult their inter-

pretation. The unhealthy life styles, physical inactivity, and obesity are linked to the increasing prevalence of diabetes mellitus<sup>15</sup>.

Similar results, with regard to obesity, were found in other studies such as Núñez *et al*<sup>16</sup>, while other ones reported higher figures, for example, 42% in Contreras *et al*<sup>17</sup> and 57.31 % in Miranda and Hernández<sup>18</sup>.

Recent technological advances and high success rates have led to an increase in the use of PCI procedures for acute coronary syndrome in recent years. The effectiveness of PCI in NSTEMI-ACS is heterogeneous, which probably reflects differences in design, treatment strategies, patient selection and operator experience. Nevertheless, its success rate is very high<sup>19</sup>, something that has also been shown in our study. Also, in the TIMI IIIB study, angiographic success was achieved in 96 % using balloon angioplasty, with periprocedural infarction in 2.7 % of patients and need for emergency surgery in 1.4 % of patients, with a mortality rate of 0.5%<sup>20,21</sup>. These values are comparable with those found in our study. The findings suggest that the results are similar in terms of the immediate success of PCI performed in patients with stable angina or NSTEMI-ACS.

As evidenced in the Spanish Registry of Cardiac Catheterization and Interventional Cardiology in 2009, with regard to the overall results of the PCI, the figures from previous years remain, with 95 % success, 4.6 % failure without complications and 1.5% complications, that includes 0.4 % mortality in the procedure, 0.7 % acute myocardial infarction and 0.1% emergency surgery<sup>22</sup>, results that are similar to those found in our series.

The rate of acute complications was reduced to less than 1%<sup>19</sup> as a result of improved safety and technical development of guides and catheters, angioplasty balloons and stents; a result similar to that in our series.

In 2007 and 2009, there was a decrease in the number of interventional procedures performed, compared to previous years, mainly due to the remodeling of the catheterization and interventional cardiology unit of the ICCCV where the majority of our patients who are candidates for coronary angiography and PTCA are treated, due to its proximity to our hospital.

## CONCLUSIONS

The interventional treatment as a distance service is a method that is available, safe, suitable and beneficial,

considering its high rate of success, although it is not without risks. The results have been very favorable, especially in patients with acute coronary syndrome.

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