

## Retrospective Study of Out-of-hospital Sudden Cardiovascular Death in Middle-aged Adults in Barcelona City

### Estudio retrospectivo de la muerte súbita cardiovascular extrahospitalaria de adultos de mediana edad en la ciudad de Barcelona

#### To the Editor,

Cardiovascular diseases are one of the main causes of death among middle-aged adults. In many cases, out-of-hospital sudden death is the first manifestation of the disease. The epidemiological characteristics of out-of-hospital sudden cardiovascular death are poorly defined.<sup>1</sup> The objective of the present study was to determine the incidence and causes of out-of-hospital sudden cardiovascular death between 2004 and 2006 in the city of Barcelona.

A descriptive and retrospective population study was undertaken using the deaths registry of the city of Barcelona, which integrates data provided by the *Departament de Salut* (Health Department) and information generated from forensic autopsy reports.<sup>2</sup> All deaths of individuals aged between 35 and 49 years, resident in Barcelona, who died between 2004 and 2006, were selected if the cause of death was considered due to cardiovascular causes (ICD-10 I00 to I99 or Q20 to Q28) and the patients had undergone autopsy. Two forensic physicians accessed the autopsy reports of the selected cases. These reports included information

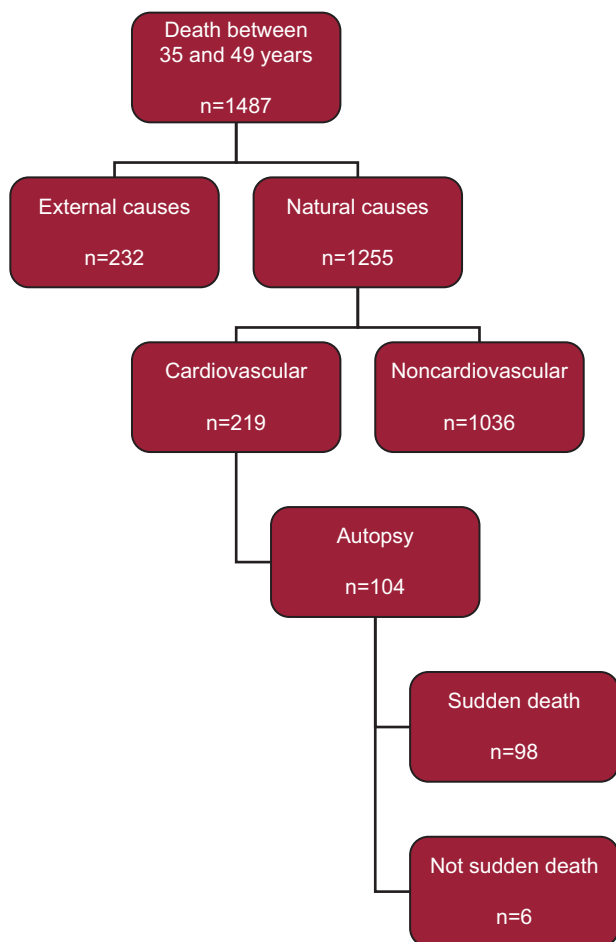
on personal and family history, place and circumstances of death, external and internal examinations, and complementary tests.<sup>3</sup> It was then established whether or not the case could be described as sudden death according to the criteria used by Morentin et al.<sup>1</sup> No other information was collected from the autopsy report. The mortality rates adjusted for age according to the European standard of 35 to 49 years for each sex were calculated, along with the overall rate, the relative risk between sexes, and the specific rates for 5-year age groups.

In the study period, there were 219 cardiovascular deaths, of which approximately half (47.5%) underwent autopsy; most of these (94.2%) were cases of sudden death (Figure). Overall, 44.7% of cardiovascular deaths and 6.6% of all deaths in this age range were out-of-hospital sudden cardiovascular deaths. The age-adjusted mortality rate was 9.52/100 000 inhabitants (95%confidence interval [95%CI], 7.73-11.61). Among men it was 16.50 (95%CI, 13.13-20.46) while among women it was 2.88 (95%CI, 1.61-4.74); the relative risk between sexes was 5.73 (95%CI, 4.61-7.11). The specific rates for age groups were 4.43 (35-39 years), 9.33 (40-44 years), and 14.81 (45-49 years). The Table shows the distribution of the causes of death.

Approximately half the cardiovascular deaths among adults aged between 35 and 49 years in the city of Barcelona were sudden cardiovascular deaths investigated by the *Institut de Medicina Legal de Catalunya*, as was the case in the study in Vizcaya.<sup>1</sup> The importance of the forensic sources is recognized in the study of deaths due to external causes,<sup>2</sup> and of the clinical and pathological characteristics of a sudden death<sup>4</sup>; however, studies such as the present one or that of Morentin et al.<sup>1</sup> indicate that they also should be incorporated into the analysis of incidence.

The rates observed in our study were systematically lower than those of the study in Vizcaya, which in turn were lower than those reported in studies in English-speaking countries, as has been the case with studies in Spain.<sup>5</sup> Of particular note are our data stratified by sex, in which a standard rate in women of almost 50% and a relative risk for men almost twice that of the study in Vizcaya<sup>1</sup> stand out. Also of note is the much lower rate in the age range of 45 to 49 years. However, our data may underestimate the incidence because the study did not include residents whose death due to cardiovascular causes occurred outside the city area (3.3% in the study in Vizcaya).

Cardiovascular causes account for 90% of sudden deaths in Spain, and heart disease accounts for 80%.<sup>4</sup> As in the Vizcaya study, our study shows that ischemic heart disease is the main cause of sudden death, followed by other heart diseases and cerebrovascular diseases.



**Figure.** Distribution of sudden cardiovascular death in residents of the city of Barcelona aged between 35 and 49 years (2004-2006).

**Table**  
Causes of Sudden Cardiovascular Death

Causes of SCD (ICD-10)	No. (%)
Hypertensive diseases (I10-I15)	0 (0.0)
Ischemic heart diseases (I20-I25)	62 (63.3)
Cardiopulmonary disease and circulation diseases (I26-I28)	4 (4.1)
Other heart diseases (I30-I52)	17 (17.3)
Cerebrovascular diseases (I60-I69)	10 (10.2)
Arterial, arteriole, and capillary diseases (I70-I79)	4 (4.1)
Congenital malformations of the circulation system (Q20-Q28)	1 (1.0)
Total	98 (100)

SCD, sudden cardiovascular death.

Our study has certain limitations. This was a retrospective study, with the drawbacks entailed by such a design; however, the percentage of patients excluded in our study for deaths that were not sudden (5.8%) is close to that reported in the prospective study of Morentin et al.<sup>1</sup> (9.4%), and the distribution of causes of death in both studies is very similar. In addition, we do not report clinical information (history of cardiovascular disease and cardiovascular risk factors) or substance abuse. This information would be very relevant in the prevention of the causes. Despite these limitations, the study shows that ischemic heart disease is the main cause of death and therefore prevention of this disease should be a priority, without neglecting other emerging causes such as hereditary arrhythmogenic diseases.<sup>6</sup> In short, the present study corroborates the low incidence of sudden cardiovascular death already reported in other studies in Spain.

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## Pseudopheochromocytoma as a Cause of Resistant and Paroxysmal Hypertension Successfully Treated by Percutaneous Renal Denervation

### *Seudofeocromocitoma como causa de hipertensión arterial refractaria y paroxística tratada con éxito mediante denervación renal percutánea*

#### To the Editor,

Pseudopheochromocytoma is characterized by severe symptomatic paroxysmal hypertension (HT) similar to the clinical picture of pheochromocytoma but with normal catecholamine concentrations and the absence of an adrenal tumor on imaging study. Pseudopheochromocytoma is an infrequent entity of unknown etiology, antihypertensive treatment is generally ineffective, and many patients incur chronic disability. Although the physiopathology of this entity is also unknown, the autonomic nervous system is thought to play a fundamental role since the presence of sympathoadrenal hyperactivity has been proven.<sup>1</sup> To treat resistant HT, an invasive technique has recently been developed, which involves percutaneous radiofrequency ablation of the sympathetic nervous system via a catheter deployed at the level of the renal arteries.<sup>2</sup>

We describe the case of a 32-year-old woman with an unremarkable past medical history and longstanding hypertensive crises with values of 230/120 mmHg accompanied by sweating, headache, trembling and tachycardia and lasting from 10 min to several hours. Between crises, her blood pressure (BP) remained high. Other causes of secondary HT were excluded, as was pheochromocytoma, after several catecholamine determinations and diverse imaging studies.<sup>3</sup> The final diagnosis of exclusion was pseudopheochromocytoma, and treatment was initiated with alpha- and beta-blockers, as well as psychotherapy. At the last medical visit, after an 8-year history of HT, the patient had mild left

ventricular hypertrophy, with a left ventricular mass index of 116 g/m<sup>2</sup>. The HT crises became less frequent, but did not disappear; HT figures remained high despite treatment with 5 drugs, including a diuretic. Percutaneous renal denervation was indicated and performed using right femoral artery access with deep sedation and a Symplicity radiofrequency catheter (Medtronic). Two 2-min radiofrequency applications were made at the level of the left, right and right accessory renal arteries (Fig. 1). The procedure was uneventful and the patient was discharged at 24 h. Fifteen days before the procedure, 24-h ambulatory blood pressure monitoring recorded a mean systolic BP of 156 mmHg and a mean diastolic BP of 112 mmHg (Fig. 2A). At 4 weeks after the procedure, the patient—following the same drug regimen—underwent ambulatory blood pressure monitoring again, with a mean systolic BP of 111 mmHg and a mean diastolic BP of 80 mmHg (Fig. 2B). At 5 months, there had been no recurrence of symptomatic HT and BP values were within the normal range; the patient's drug regimen included only 1 antihypertensive agent.

The physiopathology of pseudopheochromocytoma is currently unknown, although the principle mechanism is thought to be activation of the sympathetic nervous system (increased dopamine and epinephrine secretion and some hypersensitivity of the adrenergic receptors), often associated with an emotional factor.<sup>1</sup> Given how little is known, treatment is usually complex and includes 3 approaches: antihypertensive treatment (a regimen of alpha- and beta-blockers is usually recommended); psychopharmacologic treatment (antidepressants and benzodiazepines), and psychotherapy, although in 40% of patients or more it is ineffective.<sup>4</sup> Sympathetic nervous system ablation may be a therapeutic option in the subgroup of patients with resistant HT and paroxysmal crises associated with proven sympathetic hyperactivity. To our knowledge, this is the first description of a case of pseudopheochromocytoma efficiently treated by percutaneous ablation of the sympathetic renal arteries. We consider it likely that patients with this condition may have been enrolled in