

## Stroke in the late 19th and early 20th centuries: a clinical and therapeutic review

A. Arboix<sup>1</sup>, M.G. Fabregas<sup>1</sup>, J.L. Martí-Vilalta<sup>2</sup>

<sup>1</sup>Cerebrovascular Disease Unit, Department of Neurology, Capió-Hospital Universitari del Sagrat Cor, Universitat de Barcelona, Barcelona, Spain.

<sup>2</sup>Department of Neurology, Hospital de la Santa Creu i Sant Pau, Universitat Autònoma de Barcelona, Barcelona, Spain.

### ABSTRACT

**Introduction.** This article describes what was known about strokes, their clinical manifestations, and their treatment 100 years before the approval of thrombolytic therapy, the first effective treatment for ischaemic stroke.

**Methods.** We performed a literature search on MEDLINE using the following keywords: 'cerebrovascular diseases' and 'history'. We also referred to the doctoral thesis by M. G. Fabregas, *Història de la Neurologia a Catalunya. De l'any 1882 a l'any 1949* (History of Neurology in Catalonia from 1882 to 1949), Dr Falp's medical topography *Estudio general de la apoplejía -feridura- en Solsona, 1901* (General survey of apoplexy -stroke- in Solsona, 1901), and original historical sources from the library of the Academy of Medical and Health Sciences of Catalonia and the Balearic Isles, Barcelona.

**Results.** During the period we researched, stroke was more common in males than in females, and most patients were aged between 51 and 60 years. There were no records of stroke in patients older than 85. Strokes with loss of consciousness and hemiplegia without loss of consciousness are the main clinical types that were recorded. Blood-letting, leeches, and galvanic current were routinely employed under certain circumstances. Mortality during the acute phase was greater than 57%.

**Conclusions.** Compared to the situation today, strokes 100 years ago were more severe, affected younger patients, and had a higher mortality rate.

### KEYWORDS

Cerebrovascular disease, history, neurology, Catalan Society of Neurology, stroke.

### Introduction

Little was known about cerebrovascular disease (CVD), stroke, and the clinical manifestations and treatment of these entities 100 years before thrombolysis, the first effective treatment for ischaemic stroke, was approved in 1995.<sup>1</sup> Between the late 19th century and the early 20th century, strokes were unpredictable and extremely severe. The lack of reference material on strokes, and the limited interest in the disease at the time, may explain why so little was known about the science of strokes during that period.<sup>2-4</sup> We present a historical analysis with particular emphasis on stroke demographics, clinical traits, and treatment approaches. Our aim is to raise awareness about the history of strokes, highlight its importance and transcendence, and investigate any clinical and prognostic differences between strokes a century ago in our region and those occurring today.

### Methods

To this end, we used MEDLINE to perform a literature search of the keywords 'cerebrovascular diseases' and 'history' with no date limits. We also performed a directed search using the following texts: 1) the doctoral thesis by Marta Gloria Fabregas Camps, *Història de la Neurologia a Catalunya. De l'any 1882 a l'any 1949*, presented and defended in 1992 at Universitat Autònoma de Barcelona<sup>5</sup>; 2) the medical topography by Dr J Falp, *Estudio general de la apoplejía -feridura- en Solsona, 1901* (Figure 1)<sup>6</sup> and 3) original historical literature sources selected from the authors' own literature search in the library of the Academy of Medical and Health Sciences of Catalonia and the Balearic Isles, Barcelona. We mainly analysed documents and data on strokes 100 years ago, with an associated confidence interval for time of approximately 10 years; our results are shown below.

Corresponding author: Dr Adrià Arboix.  
Cerebrovascular Disease Unit, Department of Neurology,  
Capió-Hospital Universitari del Sagrat Cor,  
C/ Viladomat 288. 08029 Barcelona, Spain.

Telephone: (+34) 934948940; Fax: (+34) 934948906.  
E-mail: aarboix@hscor.com

## APÉNDICE A LA MEDICINA LOCAL

### I

#### ESTUDIO ORIGINAL DE LA APOPLEJÍA (Ferdura) EN SOLSONA

##### Concepto especial de la enfermedad

La apoplejía en Solsona, por su frecuencia relativa y por el sello especial que reviste, bien merece capítulo aparte. En Barcelona es también muy frecuente (1), pero ello ha sido explicado por ciertas condiciones climatológicas abonadas al reumatismo (2), que por lesiones endocardiacas predispone a la embolia cerebral y también por el predominio encefálico que la civilización acarrea, exponiendo al cerebro a continuas y brutales sacudidas que alteran su textura, trastornos que engendrarían esa vulnerabilidad cardio-vascular hereditaria que se observa en Barcelona, y que asociada a otras causas de índole degenerativa predispone a la apoplejía.

Mas, en Solsona, donde el médico como en todo pueblo de corto vecindario está en mejores condiciones para recoger observaciones verídicas y completas, distinto ha sido el concepto etiológico que he formado de dicha enfermedad, pues a falta de aquellas causas predisponentes, otras se me han presentado después de un largo y concienzudo examen de los hechos. Empero, fué preciso primeramente, que aleccionado por la experiencia de 44 casos clínicos (3) que historio y clasifico al final de este capítulo al modo de una estadística comprobante, sintiese antes de escribir estas líneas una convicción profunda, que he procurado robustecer con el testimonio de los autores antiguos y modernos más competentes.

Lo primero que me sorprendió al tener recogidos estos datos, fué la característica orgánica de los sujetos observados, caquéticos y destituidos de resorte vital, afectos de catarros crónicos, cirrosis, nefritis, artritis, etcétera, etc., de temperamento más bien abdominal que torácico ó sangui-

(1) En la mortalidad del quinquenio de 1876 á 1880, figura en la proporción de 11'31 por 100, cifra algo exagerada.—(N. del A.)

(2) Eichhórst, ed. esp., tom. III, pág. 398.

(3) Parte de estas historias clínicas fueron recogidas por mi abuelo el Dr. Esteban Plans.—(N. del A.)

**Figure 1.** First page of Dr Falp's medical topography of his original study on apoplexy (*feridura*) in Solsona. Appendix in *Medicina Local* (1901).

## Results

### 1. Nomenclature

The documents we analysed make use of two terms: 'ictus' and *apoplejía* (apoplexy).<sup>2,7</sup> The term 'ictus', from the Latin *ico* (a blow), was used to refer to swift and sudden events or attacks of illness (epileptic ictus, ictus cordis, apoplectic ictus, etc.). The Spanish term *apoplejía* is derived from the Greek *apoplexia* (to fell or lay low by violence) and denoted 'intense symptoms', meaning sudden loss of consciousness, loss of mobility, or loss of sensitivity.

### 2. Classical precursors

The modern study of anatomy was developed during the Renaissance by Leonardo da Vinci and Vesalius. Vesalius' pivotal work –*De humani corporis fabrica*, edited in

1543 in seven volumes– was a milestone in the history of medicine. That book displays and corrects some 200 erroneous anatomical sketches from the work of Galen, which until then had been the undisputed canon in medicine.<sup>2,3</sup>

Following that, William Harvey described the circulation of blood in his 1628 monograph *Exercitatio anatomica de motu cordis et sanguinis in animalibus*.<sup>8</sup>

Thomas Willis (1621-1675) is considered to be the true founder of neurology as a scientific discipline, and he used the scientific method in his studies. He was also the first to coin the term 'neurology', taken from the Greek term for tendon, cord, or nerve. He described the arterial formation at the base of the cranium which bears his name today.<sup>2</sup>

The authors who described classic syndromes having to do with brainstem disorders (vascular or otherwise)<sup>4</sup> are also important in the history of neurology. These syndromes include Millard-Gubler syndrome (1856; functional loss of the seventh cranial nerve with contralateral hemiplegia due to lesion of the pons); Foville syndrome (1858; paralysis of conjugate eye movement with hemiplegia due to pons lesion); Sturge-Weber syndrome (1863; paralysis of the third cranial nerve with contralateral hemiplegia due to mesencephalic lesion); Jackson syndrome (1867; loss of ninth, tenth, and eleventh nerves with contralateral hemiplegia caused by medulla oblongata lesion); Raymond-Cestan syndrome (1895; paralysis of sixth cranial nerve with contralateral hemiplegia due to pontine lesion); bilateral pontine lesions causing quadriplegia with bilateral facial paralysis, bilateral facial paralysis with hemiplegia, facial paralysis with quadriplegia, or bilateral facial paralysis; and Wallenberg syndrome (1893, sensory deficits due to lateral-bulbar ischaemic lesion).<sup>4</sup>

### 3. The French masters

An important advance in 19th century medicine was the rise of the new 'clinical-anatomical' concept of neurology propounded by Jean-Martin Charcot (1825-1893), who studied under Duchenne and was the founder of classic clinical neurology.<sup>2</sup> Jean-Martin Charcot was the first professor of neurology and the maximum authority on that discipline in his time. Working in partnership with Bouchard, he described miliary aneurysms and their relationship with intracerebral haemorrhages.<sup>2,9</sup>

These events created the necessary momentum for Babinski, Brissaud, Pierre Marie, Dejerine, and Souques to found the first neurological society, *La Société de Neurologie de Paris*, in 1899.<sup>2</sup> Additional mention should be made of the history of the study of lacunar infarcts. French neurologists Pierre Marie and Charles Foix were the first authors to address the subject, using a largely pathological approach. At a later date, C.M. Fisher described classic lacunar syndromes and the lacunar hypothesis, after which J.P. Mohr's invaluable reference expounded on that knowledge, raised awareness, and provided care guidelines. Due to their geographic proximity, Catalan and other Spanish neurologists were particularly influenced by the teachings of French neurologists.<sup>13,14</sup>

#### 4. Historical figures in Catalonia

Catalonia's groundbreaking figures in neurology 100 years ago included Luis Barraquer Roviralta (1855-1928), founder of clinical neurology in Spain and director of the first neurology department at the now-vanished Hospital de la Santa Creu de Barcelona in 1882,<sup>9,15</sup> and Artur Galceran i Granés (1850-1919) founder and President of *La Sociedad de Psiquiatría y Neurología de Barcelona* in 1911. That association was the first neurological society in both Catalonia and Spain,<sup>16-21</sup> and its statutes were published in *Gaceta Medica Catalana*, a prestigious medical journal of the time.<sup>22</sup>

Both Barraquer Roviralta and Galceran i Granés conducted research and published occasional papers on cerebrovascular disease.

#### 5. Stroke a century ago

The study of stroke in Catalonia began to develop at the same time as clinical neurology itself. The feature which set Catalan neurology apart from other currents in neurology was its approach to care. Ever since the discipline arose more than a century ago, it has been dedicated exclusively to neurological patients, which it distinguishes clearly from psychiatric patients. Three generations of doctors in the Barraquer dynasty (Barraquer Roviralta, Barraquer Ferré, and Barraquer Bordas), along with pioneers such as Bonaventura Clotet, Rodríguez Arias, Gispert, Subirana, Espadaler, and Oliveras de la Riva, all studied different facets of CVD.<sup>23,24</sup> We should point out that during the 19th century and most of the early 20th century, stroke patients who came to hospitals were ei-

ther indigent or nearly so; other stroke patients generally received medical care in their own homes.<sup>23</sup>

#### 6. Treatment

Treatments for acute CVD were extremely limited at best in the 19th and early 20th centuries. Blood-letting (Figure 2), emetics, certain sedatives, and galvanic stimulation were the only strategies available to doctors.<sup>23</sup>

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Después no la vi más, pero tardó, según supe, mucho tiempo en morir.  
**OBSERVACIÓN XIV**—Fray F., anciano de 60 años, robusto, buen color, poco comedor y alcohólico.  
 Ataque de hemiplegia izquierda con integridad de la inteligencia y de la locución. Rostro congestionado de color subido, boca nada torcida, pulso fuerte y lleno. Sangría.  
 Por la mañana del tercer día, mientras conversaba, pierde de súbito los sentidos y se agita en fuerte convulsión.  
 Muerte por la noche.

**Figure 2.** Note and medical history for case 24 in Dr Falp's medical topography. Here, we observe that blood-letting was prescribed for a patient experiencing left hemiplegia.

Measuring systolic blood pressure was made possible by Riva Rocci's improved sphygmomanometer, introduced in 1896. In 1905, Korotkoff described the technique for measuring diastolic pressure using a stethoscope. The first studies relating arterial hypertension with atherosclerosis were published in the early 20th century, and the link between hypertension and stroke was first demonstrated around the 1930s.<sup>25</sup> It was not until the late 1950s, however, that neurologists demonstrated that hypotensive treatment was effective for preventing cerebral circulatory disorders.<sup>26</sup>

#### 7. Research

Confusion and lack of knowledge about stroke were widespread among general practitioners during the 19th and early 20th centuries. By that time, sanguine apoplexy was associated with cerebral haemorrhage, but serous or nervous (non-haemorrhagic) apoplexy had not yet been clinically associated with cerebral infarct.<sup>23</sup>

One aspect of stroke medicine which received little attention anywhere in Europe during this period was epidemiology. However, the Royal Academy of Medicine of Catalonia led the way in promoting innovative studies known as medical topographies, which made use of an epidemiological approach. Inspired by the Hippocratic idea that a physician should dedicate himself not only to the patient being cared for, but also to the geographical

area in which he works, the Royal Academy of Medicine of Catalonia encouraged doctors to keep demographic and epidemiological records of the populations they served. This initiative was launched in the mid-19th century, and a prize for the best report was awarded every year.<sup>23</sup> In their medical topographies, doctors analysed the illnesses, including ictus, that were present in the areas in which they offered care.

One such topography on apoplexy in Catalonia evaluated mortality rates between 1880 and 1884 (Table 1).<sup>27</sup>

City	Barcelona	Tarragona	Girona	Lleida
Population	836 887	299 702	330 105	285 339
Year 1880	2386	592	620	495
Year 1881	2210	592	620	495
Year 1882	2358	352	416	207
Year 1883	2120	443	389	106
Year 1884	2263	571	427	359
Mortality rate per 100 000	271	148	136	96

Table 1. Stroke mortality.<sup>27</sup>

We should also highlight that the First Catalan Congress on Hygiene was held in Barcelona on 27 June 1906, and included an epidemiological lecture titled *Freqüència de la apoplexia cerebral a Catalunya i medis d'evitar-la* (Frequency of cerebral apoplexy in Catalonia and means of prevention), presented by J. Tarruella and H. Carrera (Figure 3).

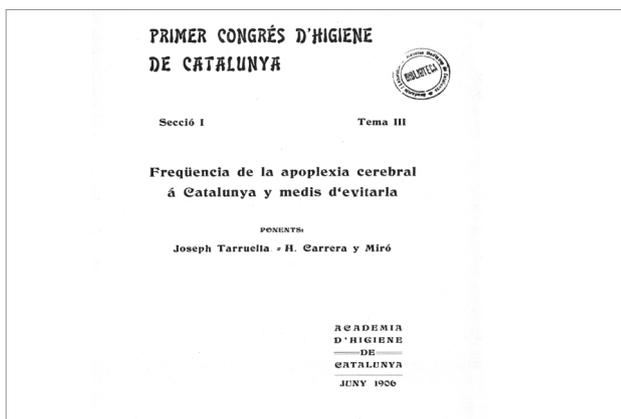


Figure 3: Programme from the First Catalan Congress on Hygiene in 1906. Section I, heading III contains the analysis of the frequency of apoplexy in Catalonia and means of preventing it.

Very few books or monographs on stroke were published or available at the beginning of the 20th century; key texts are listed in Table 2.

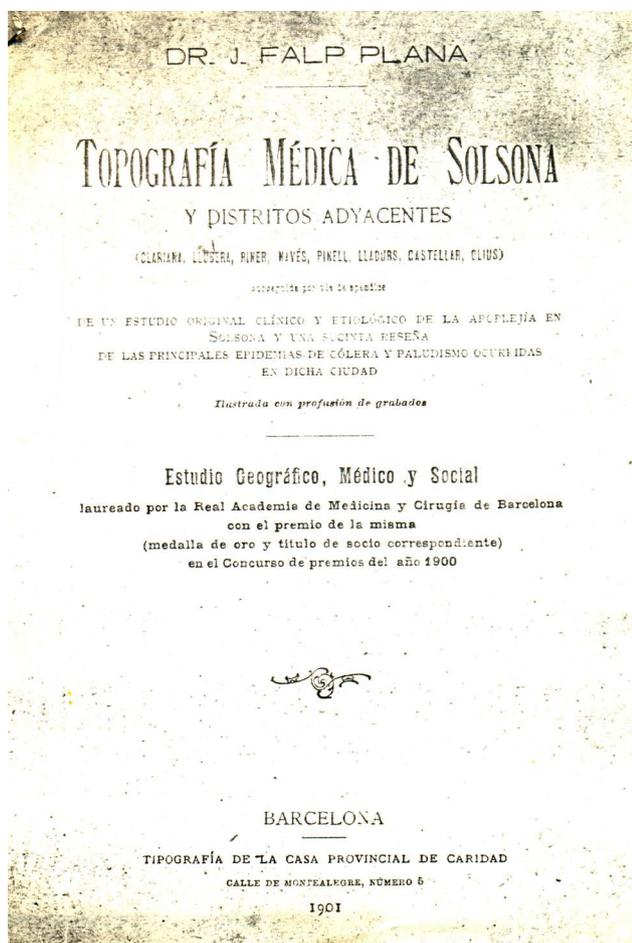
- *Dictamen de la Acadèmia Médico-Pràctica de la ciutat de Barcelona sobre la freqüència de les morts repentinament i apoplejías.* Barcelona: Printed by Carlos Gibert y Tutó, 1784.<sup>28</sup>
- *Apoplejía cerebral.* Codina Castellví J. Volume with 558 pages. Barcelona: Typolithography by Luis Taso, 1899.<sup>27</sup>
- *Tratado teórico-práctico de la apoplejía.* Tenas P. Barcelona: Viuda Sastres e hijos; 1819.<sup>29</sup>
- *Estudio de la apoplejía en Solsona.* Falp Plana J. In: Topografía médica de Solsona. Barcelona: Casa Provincial de Caridad; 1901.<sup>6</sup>
- *Freqüència de l'apoplexia cerebral a Catalunya i medis d'evitar-la.* Tarruella J, Carrera y Miró H. Barcelona: Acadèmia d'Hygiene de Catalunya; 1906.<sup>30</sup>
- *Preceptiva de vasos y corazón. Estudio de vulgarización médica acerca la apoplejía y el mal arterial.* Durán Arrom D. Barcelona: Editorial Poliglota; 1924.<sup>31</sup>

Table 2. Major books and monographs on ictus that were published or already available in early 20th-century Spain.

## 8. Dr Falp's medical topography

The medical topography by Dr Falp (*Estudio general de la apoplejía -feridura- en Solsona, 1901*), awarded the gold medal by the Royal Academy in 1900 (Figure 4), presents a sample of 44 cases, an exceptional number of patients for a moment in history in which diseases of this type were not typically studied (Figure 5).<sup>6</sup> The author states that "...Solsona, like any small village, offers the best conditions for gathering true and complete observations". During the study period, stroke was more frequent in males (23 cases) than in females (21 cases), and most typically appeared in subjects between the ages of 51 and 60 (19 cases). They were less frequent among subjects aged 41 to 50 years (9 cases) and subjects aged 61 to 70 years (10 cases). There were no recorded cases in subjects older than 85. The main clinical types described by the doctor were strokes with loss of consciousness and hemiplegia without loss of consciousness. The notes and medical histories in the verification statistics for the cases describe clinical cases that may be completely compatible with lacunar infarct (cases 7 and 11), cerebral haemorrhage (cases 14, 28, and 35), cardioembolic infarct (cases 8, 29, and 39) and transient ischaemic

attacks (cases 37 and 40). Blood-letting (cases 1, 2, 3, and 14) and the use of leeches (case 44) were prescribed in certain circumstances. Mortality during the acute phase was greater than 57% (25 of 44 cases).



**Figure 4.** Medical topography of Solsona and neighbouring districts elaborated by Dr J. Falp, marked as the Royal Academy of Medicine of Catalonia's gold medal winner for 1900.

### 9. Current comparative study

Comparing the historical data with data reflecting the current clinical situation shows that 100 years ago, 1) ic-tus occurred in younger patients.<sup>32</sup> 2) Due to life expectancy being shorter, no very elderly patients (> 85 years) were reported to have suffered a stroke. Today, patients in this age range account for 15% to 20% of the total.<sup>12,33</sup> 3) The lack of complementary tests at the time is a clear impediment to categorising strokes by their aetiological subtypes.

Despite this difficulty, clinical reports suggest lacunar syndromes, possible cardioembolic stroke, TIA, or stroke

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Profesión:	
Sin oficio ni profesión liberal. . . . .	36
Religiosos. . . . .	6
Labriegos. . . . .	1
Abogados. . . . .	1
	44
Característica orgánica:	
Flacos pálidos . . . . .	14
Demacrados caquéticos. . . . .	13
Flacos buen color. . . . .	7
Obesos pálidos. . . . .	1
buen color. . . . .	1
Robustos y sanos . . . . .	5
Antes robustos; demacrados luego. . . . .	3
	44
Régimen alimenticio:	
Frugal ordinario. . . . .	19
Insuficiente . . . . .	17
Malo por miseria. . . . .	4
Bueno y abundoso. . . . .	4
	44
Influencias psíquicas ó neurósicas:	
Grandes emociones é inquietudes . . . . .	11
Carácter irascible é inquieto. . . . .	7
Con propensión á la pereza y al sueño. . . . .	17
Laboriosos y activos. . . . .	4
Indeterminados. . . . .	5
	44

**Figure 5.** Demographic characteristics of the sample of 44 stroke patients included in Dr Falp's medical topography.

caused by a possible cerebral haemorrhage.<sup>34,35</sup> 4) Stroke care was provided at the patient's home,<sup>23,36</sup> contrary to modern practice in which emergency care for strokes is provided by hospital neurology units. 5) The few treatments provided at that time included blood-letting, topical application of leeches, and galvanic electrotherapy, which were prescribed only in selected cases. 6) Mortality during the acute phase was higher than 50%, while mortality among stroke patients today is less than 15% according to most annual registries.<sup>32</sup>

### Conclusions

A century before thrombolytic treatment was approved, according to the data from Solsona province, strokes were severe events and their mortality rate during the acute phase was higher than it is today. In addition, they tended to affect younger patients who were typically treated at home.

### Conflicts of interest

The authors have no conflicts of interest to declare.

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