Early origins of Spanish neurosurgery: those general surgeons who operated on the brain

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ABSTRACT

This study analyses ten general surgeons who preceded the birth of neurosurgery as a specialty in Spain in the second half of the 19th and first third of the 20th centuries. Prior references exist, such as the work of Andrés Alcázar, in 1570, and studies presented by aspiring surgeons before the literary councils of the Royal College of Surgery of San Carlos, around 1780. A decisive role was played by Federico Rubio y Galí, who in 1880 promoted specialisation at the Instituto de Terapéutica Operatoria in Madrid. He promoted the neurosurgical training of three general surgeons, in addition to creating a neurology consultation. Eduard Tolosa i Colomer was encouraged to train in neurosurgery by Lluís Barraquer Roviralta, director of the neurology department at Hospital de la Santa Creu i Sant Pau in Barcelona, where he was followed by his son, Lluís Barraquer Ferré. More recently, Enrique Areilza Arregui and Ricardo Bueno Ituarte began their careers in the specialty in the Basque Country. The most frequent interventions at the time were the surgical repair of depressed skull fractures after accidents, extirpation of cortical scarring associated with jacksonian seizures, and drainage of cerebral abscesses. As an exception, Alejandro San Martín treated the Gasserian ganglion or its branches in patients with facial pain, based on his pathophysiological understanding and excellent training in anatomy. Lesion localisation was generally based on external signs and semiological details, such as aphasia and jacksonian seizures, and diagnosis was sometimes supported by such neurologists as Serafín Buisen and Luis Simarro. The latter deduced the localisation of a brain tumour based on cranial reference points. In 1936, Eugenio Díaz Gómez was the first to present neuroradiological images of the brain, obtained after injection of contrast medium.

KEYWORDS

Protoneurosurgeons, Federico Rubio y Galí, Alejandro San Martín, Eulogio Cervera Díaz, Eduard Tolosa i Colomer, Ricardo Bueno Ituarte, Eugenio Díaz Gómez

Dedicated to the memory of the neurosurgeon and writer José María Izquierdo Rojo (Oviedo, 1944 - Llanes, 2024)

Introduction

Contemporary neurosurgeons place the beginning of the specialty in Spain between 1890 and 1939.[1-5] Nonetheless, neurosurgery was not officially recognised until 1941, when Eugenio Díaz Gómez directed a mixed general and neurosurgery department at Hospital Provincial de Madrid.[6,7] The specialty took off in the 1950s, under the leadership of Sixto Obrador Alcalde (Santander, 1911 - Madrid, 1978). Supported by the professor of internal medicine, Carlos Jiménez Díaz, the Institute of Neurosurgery was established on Calle de los Olivos in a narrow, two-storey building in the metropolitan park of Madrid, on the city's outskirts. After overcoming numerous hurdles, some 1373 operations were performed over a period of nine years, including the first hemispherectomies.[8,9] A large group of disciples were trained under Obrador and extended the specialty across the country.

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Figure 1. Federico Rubio y Galí, in an engraving from the time. Source: Banco de Imágenes de la Medicina de España de la Real Academia Nacional de Medicina de España.

This was a difficult time: Eduardo Lamas Crego (1927-2012) nostalgically recalls the 1950s, when neurosurgery was still poorly understood by physicians and patients.[10]

A medical specialty does not take root overnight. Spanish neurosurgery had its origins in the protoneurosurgeons, expert general surgeons with the capability to perform operations on the cranium and brain. The creation of the specialty required determined individuals with innovative ideas, properly resourced institutions, and a favourable social and political climate. This came to pass with Federico Rubio y Galí, who founded the Instituto de Terapéutica Operatoria (Institute of Surgical Therapy) on the outskirts of Madrid; this exemplary hospital complex saw the birth of vocations and the beginning of numerous specialties, including brain surgery, as well as an outpatient neurology consultation.[11-13] This might represent the response to the precarious conditions that Gregorio Marañón denounced at the Hospital General: "a centre with the spirit of an asylum, it was dirty, lacked statistics, and produced almost no scientific work."[14]

This article describes the lives and work of ten precursors to neurosurgery in Spain,[15] not only in the major hospitals of Madrid (eg, Hospital de la Princesa, which later became the Instituto de Terapéutica Operatoria), but also in other cities where they established prestigious centres: Hospital de la Santa Creu i Sant Pau, in Barcelona, Casa de Salud de Valdecilla, in Santander, and Hospital de Basurto, in Bilbao, among others.[16]

Material and methods

The term "protoneurosurgeon" refers to those general surgeons who occasionally operated on the cranium and brain during the second half of the 19th and first third of the 20th century. Prior references exist, and are partially addressed in this study. As a starting point, we may note the work of José María Izquierdo Rojo[17] (Oviedo, 1944 - Llanes, 2024) and his publications on the history of neurosurgery[3] and neurology[18]; the work of the prolific historian José Álvarez-Sierra (Madrid, 1887 - Madrid, 1980) on Spanish surgeons[19]; and the doctoral thesis of Jesús Vaquero Crespo[20] (1950-2020), who died due to COVID-19. The publications of Eduardo Díaz Gómez in the journal *Hospital General* (1961-1970) were reviewed at the library of the Official College of Physicians of Madrid and the Ateneo de Madrid. Two works are in the author's personal library.[10,11] The data on Eduard Tolosa i Colomer are taken from the Galería de Metges Catalans. The figures are addressed in the chronological order of the year of their birth, starting with the earliest.

Results

Federico Rubio y Galí

Federico Rubio y Galí (El Puerto de Santa María, 1827 - Madrid, 1902) might be recognised as the first protoneurosurgeon (Figure 1). The application by Diego de Argumosa (1792-1865) of such surgical innovations as surgical methodology, aseptic and antiseptic technique, and the use of diethyl ether for anaesthesia enabled bold interventions.[19] At Hospital de la Princesa and the exemplary Instituto de Terapéutica Operatoria (1880-1939), Federico Rubio introduced medical specialisation in Spain.[11-13] Serafín Buisen Tomati,[21,22] an electrotherapist who converted to neurology, had been running a neurology dispensary since 1880, that is, a year before

the mayor of Barcelona promoted the neurology and electrotherapy dispensary directed by Lluís Barraquer Roviralta at Hospital de la Santa Creu i Sant Pau.[21,22] It was Buisen who advised Rubio on his intervention in patients with post-traumatic epilepsy, inspired by the observations of John Hughlings Jackson and Victor Horsley in England.[23] During the Spanish Civil War, the institute's physical premises were destroyed, but its legacy as a breeding ground for the medical vocation remained. Three of the protoneurosurgeons addressed in this article began their careers there, specifically in the institute run by Federico Rubio (Manuel Otero Acevedo, Eulogio Cervera, and Josep Ribera i Sans).

Alejandro San Martín y Satrústegui

A liberal reformist, with a love of teaching and the courage to perform risky operations on the nervous and vascular systems, Alejandro San Martín y Satrústegui (Larráinzar, Navarre, 1847 - Madrid, 1908) stands at the head of our list of protoneurosurgeons (Figure 2).[24] In 1860, he moved to Madrid with his father, who had two years outstanding to complete his medical degree, and studied at the prestigious San Isidro secondary school. At medical school, the young Alejandro was influenced by the chair of surgery, Melchor Sánchez de Toca y Sáenz de Lobera (Vergara, Gipuzkoa, 1806 - Madrid, 1880) and the Hispano-French anatomist Juan Fourquet y Muñoz (1807-1865), to whom he dedicated a lecture years later at the Ateneo.[25] The early career of a recently-qualified physician was not easy, although the influence of Alejandro's uncle, the court physician Basilio San Martín Olaechea, afforded him interesting opportunities in the capital. Among these, he was accepted as a reporter for the popular weekly medical publication *El Siglo Médico*, owned and directed by Francisco Méndez Álvaro and Matías Nieto y Serrano.[24,26] Among other missions, he travelled to a remote village in Guadalajara to research a strange epidemic disease that progressed with paralysis of the legs. Lacking a better name, San Martín named it "Azañón disease," publishing the first official account in Spain of lathyrism, a neurotoxic disease caused by excessive intake of the legume *Lathyrus sativus*[27,28].

His calling to and pathophysiological view of surgery prevailed; he visited prestigious European surgeons,[29] and eventually won a competitive examination to be chair of surgical pathology at Universidad Central.[30] Santiago Ramón y Cajal wrote an interesting biographical note on San Martín, one of his closest friends, writing

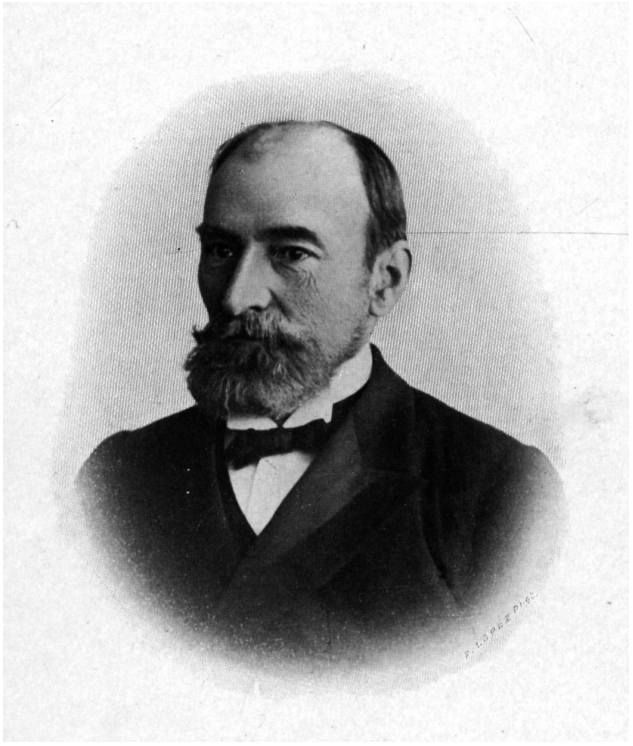


Figure 2. Alejandro San Martín Satrústegui. Source: Banco de Imágenes de la Medicina de España de la Real Academia Nacional de Medicina de España.

in his memoirs (*Recuerdos de mi vida: mi infancia y juventud*; 1901) that:

> San Martín was one of the most cultured, pleasant, and polite men I have ever met. I learnt much in conversation with him. We always got along wonderfully, perhaps due to the contrast in our personalities. San Martín met the rude frankness of my judgements with irony, euphemism, and diplomacy […]. Thanks to his advice, and above all his ability and discretion, I was able to soften that disagreeable and impolite tendency […].

Neurosurgical work: Over seven years, San Martín became particularly interested in the surgical treatment of trigeminal neuralgia. His understanding of anatomy and surgery, which he learned with Fourquet and Sánchez de Toca, enabled him to perform a complex technique consisting in "a sphenoidal approach, from the inside out, in resection of the Gasserian ganglion,"[31] which he presented at the 14th International Congress of Medicine, held

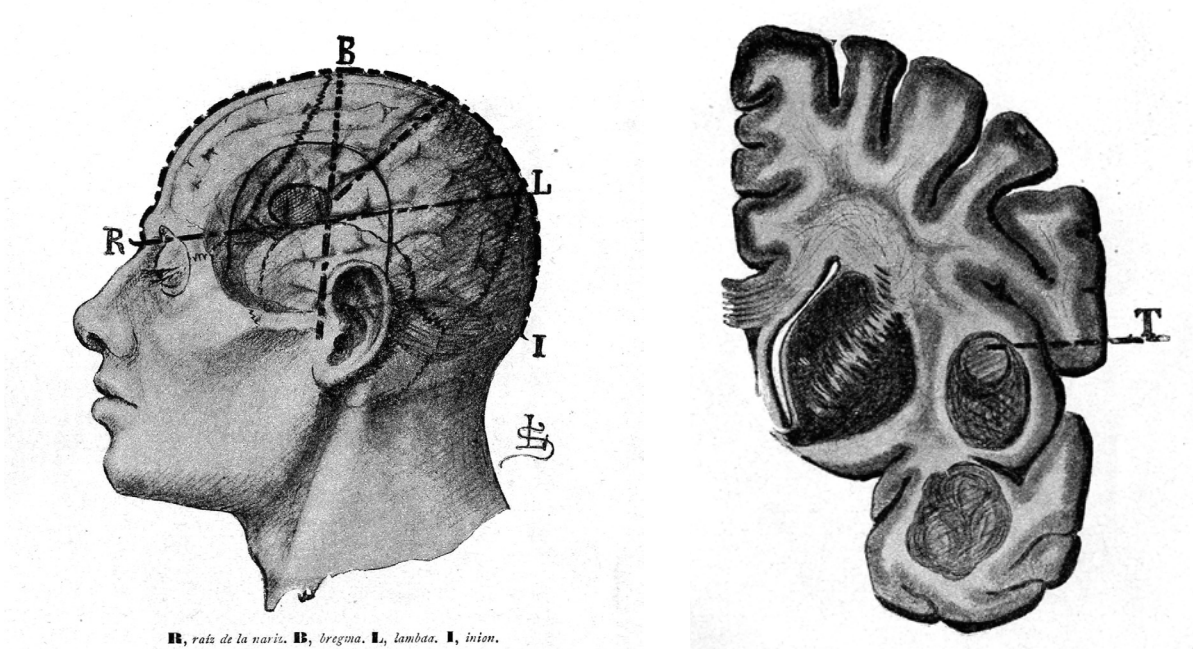


Figure 3. Left: cranial topographic references, according to a drawing by Luis Simarro. Right: autopsy examination of the brain, showing two subcortical tumours. Taken from Corral and Corral.[33]

in Madrid in 1903. He described two men, both aged 30 years, from Cádiz and Asturias, respectively, who presented with complaints that even today are difficult to classify. Later, he simplified the procedure, performing neurectomy of the second branch of the trigeminal nerve via the foramen rotundum.[32]

The Spanish protoneurosurgeons rarely treated intracranial masses. One example, studied recently by Corral and Corral, was a 54-year-old patient seen in 1894 by the neurologist and psychiatrist Luis Simarro.[33] He presented a complex clinical syndrome characterised by headache, dizziness, episodes of loss of consciousness, and aphasia, with rapid deterioration and unilateral mydriasis that led Simarro to suspect a brain tumour. He requested help from San Martín, and the two planned the surgical procedure together.[34] Simarro drew a diagram with the probable location of the tumour, based on the cranial topography of Slocker de la Pola (Figure 3).[35] After an initial trepanation, successive punctures failed to locate the tumour. Several days later, using a thicker trocar, they extracted 15 mL of yellowish liquid; the patient emerged from coma and the pupillary reflex was restored. He eventually died, and a brain autopsy revealed two subcortical tumours at the level of the insula: one was friable and contained a cyst, and the other was solid and scirrhous. We may speculate that these were multiple metastases.[33]

Another area that was renewed by San Martín was surgical treatment of the peripheral vascular system. Based on his pathophysiological understanding and experimental data, he performed arteriovenous anastomosis in patients with ischaemia due to arterial obliteration and at risk of gangrene.[36] A common disorder at the time was large aneurysms at the bend of the elbow, caused by the bloodletter's lancet.[37]

An account of San Martín's life would be incomplete if it omitted an extraordinary provision of his last will: for his body to be autopsied and sent to the dissection room

to be used to teach students. He had married his niece Julia two years before his death at the age of 61 years. The day after he died, a procession transported his remains to the faculty's great amphitheatre, where an expectant crowd awaited. The autopsy was started by the chair of anatomy, Julián Calleja Sánchez (1836-1913), and continued with the opening of the cranial cavity by the chair of dissection, Florencio de Castro y Latorre (1848-1928), a faithful student of Pedro González Velasco.[38] The brain was removed with the intention of sending it to Cajal's laboratory, but it is unclear whether it was ever examined. However, his wish to be buried "in a modest coffin in a common grave" was not observed: his remains are held in dignity at Our Lady of Almudena cemetery in Madrid.

Josep Ribera i Sans

After the death of his parents, Josep Ribera i Sans (Tivissa, Tarragona, 1852 - Madrid, 1912) (Figure 4) was forced to abandon his studies at the National Institute of Secondary Education in Reus. He was fostered by his uncle, a lawyer who lived in Almería. He studied medicine in Granada, where he was taught by the famous Juan Creus Manso (Guadalajara, 1828 - Granada, 1897), a follower of the aseptic and anaesthetic techniques introduced in Spain by Diego de Argumosa, Joaquín Hysern, and Melchor Sánchez de Toca. It is likely that, having arrived in Madrid, he would have received surgical training from Alejandro San Martín, on whom he wrote a biography in 1909.[24] The most noteworthy aspect of Ribera i Sans' career is that he pioneered paediatric surgery in Spain. In the famous Hospital del Niño Jesús in Madrid, he performed numerous operations on the osteoarticular system.[39] As far as I am aware, he was the only one of these Spanish protoneurosurgeons to operate on the spinal cord.[40]



Figure 4. Josep Ribera i Sans, Source: Banco de Imágenes de la Medicina de España de la Real Academia Nacional de Medicina de España.

Joaquín Berrueco Sánchez

Joaquín Berrueco Sánchez (1855-1923) (Figure 5) was one of the distinguished individuals of the modest town of Cervera de los Montes, set in a landscape of shrubs and wild thyme, whose population today is barely 495. He studied medicine in Madrid, worked as the town physician in Talavera, and after a spell at the Hospital Provincial in Madrid, transferred in 1883 to Hospital de la Princesa, where he reached the position of dean of public welfare. His doctoral thesis on malignant pustule, a zoonosis caused by *Bacillus anthracis*, does not hint at his future as a neurosurgeon.[41] Berrueco probably first became interested in brain surgery during his time working with Rubio at Hospital de la Princesa, on Paseo de los Areneros, near the Glorieta de San Bernardo, where the hospital building stood at the time. He probably continued working with Rubio after the inauguration of the Instituto de Terapéutica Operatoria in 1880.

Neurosurgical works: Enrique Fernández Sanz (1872-1950),[17] a prolific neuropsychiatrist from Madrid, published a case of right hemiparesis in a 28-year-old farm worker who had been kicked by a farm animal. He recovered within 20 days, with the only sequela being a left frontoparietal depressed fracture measuring 5 × 2 cm. He was healthy for the next ten years, until he developed epilepsy with daily seizures. Attacks began with paraesthesia of the right hand, followed by muscle jerks that gradually propagated from the arm to the ipsilateral leg;



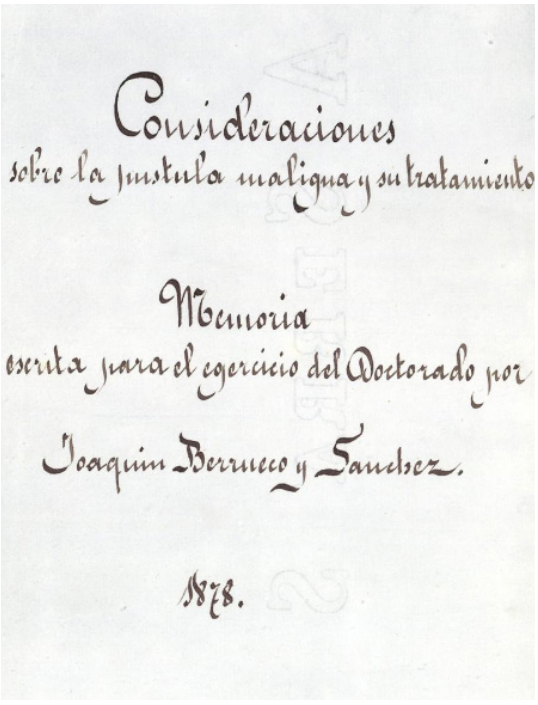


Figure 5. Left: Joaquín Berrueco Sánchez. Source: Banco de Imágenes de la Medicina de España de la Real Academia Nacional de Medicina de España. Right: title page of Berrueco's doctoral thesis. Source: Madrid medical school, doctoral theses; Universidad Complutense de Madrid

on the ward at Hospital de la Princesa, he was diagnosed with jacksonian seizures.[42] The patient was treated surgically by Joaquín Berrueco, who removed the depressed bone fragments, observing that the cerebral cortex was covered with dense pachymeningitis. Following ablation, seizures resolved completely over a follow-up period of two months. Years later, in 1908, Berrueco performed ablation of a tumour in the left cerebellar hemisphere.[2]

Eulogio Cervera Ruiz

Eulogio Cervera Ruiz (1855-1916) was born in Torrent, Valencia, but moved to Madrid to study medicine at Colegio de San Carlos (Figure 6). He obtained his medical degree in 1875, with a classification of outstanding, then earned a doctorate with special distinction, and eventually joined the medical corps.[35] For his undeniable merits, Federico Rubio y Galí hired him as head of department at the Instituto de Terapéutica Operatoria.

Neurosurgical works: In 1903, Eulogio Cervera published a 41-page monograph entitled *Neurología quirúrgica* (Surgical neurology).[43] He described in detail the cases of five surgical patients. The first two demonstrate the frequency of cerebral abscesses at the time. He unequivocally identified the localisation of the lesions, near the Broca area, due to the clinical presentation with aphasia. At the time, infection of even small wounds to the scalp could lead to complications resulting in life-threatening brain abscesses. Such was the case of a 22-year-old man who was struck over the head with a bottle, or the boy who wounded himself while playing with a bullfighter's *banderilla*. Through bold action, in the absence of asepsis, patients' lives could be saved with extensive craniectomy with drainage of the abscess and washing of the cavity with salted water. The young would-be bullfighter, for instance, remained healthy a decade later.

Another two patients, both miners, presented depressed skull fractures after being struck by rocks at work. In a 45-year-old man, the size of the lost portion of bone required insertion of an oval-shaped prosthesis made from silver, which was effective and well tolerated. The

case of another child, a young miner aged just 15 years, is harrowing: an accidental fall into a deep well caused not only multiple limb fractures, but also a loss of brain mass with bone fragments that had to be removed. The boy also survived.

The case of a 44-year-old woman was especially complex, to the extent that Cervera consulted with Serafín Buisen, who presented it at one of the Thursday clinical sessions at the institute, to hear the wisdom of Rubio y Galí. She was experiencing unbearable pain after hitting her forehead against the corner of a window, an apparently banal injury. Dr Cervera ironically described "a reputed chair, who considered it appropriate to apply a crown of burr-holes to this poor woman, of some 15 mm each." The patient, despairing, threatened to commit suicide. The protoneurosurgeon decided to perform an extensive exploratory craniectomy. Behind a large bone flap, he was surprised to find "diffuse thickening of the bone, some 32 mm thick." His diagnosis was "diffuse condensing osteitis." After removal of a fusiform fragment of the frontal bone, the patient was pain-free, remaining so after two years of follow-up.[A]

Eulogio Cervera was also interested in traumatic peripheral nerve injuries. A 22-year-old man consulted 11 years after sustaining a stab wound centimetres from the gluteal fold, severing the nerve at the level of the sciatic notch. In the operation, Cervera explained that "the ends of the nerve trunk must be refreshed, with sectioning of 1-2 cm at each end." He was able, though not without difficulty, to join them in a single trunk; after a long wait, the improvement in sensitivity was promising. The second patient was a 30-year-old man who 18 months earlier had received a heavy blow to the epitrochlear-olecranon canal on one side. This was followed by unbearable regional pain, to the point that the patient developed suicidal ideation, even asking for his arm to be amputated. In the operation, Cervera observed diffuse thickening and ventral luxation of the nerve. After biopsy ruled out a tumour, he debrided the neuroma, carefully separating the fascicles. The patient improved gradually, with pain eventually resolving fully, and presented no relapses over a five-year follow-up period.

[A]During my time as a neurosurgery intern, I recall a patient with extensive osteomyelitis of the diploid region, which was resistant to antibiotic treatment. Successive ablations of the cranial convexity using punch forceps had exposed the majority of the dura mater, which was protected with just a capeline.



Figure 6. Eulogio Cervera. Source: Banco de Imágenes de la Medicina de España de la Real Academia Nacional de Medicina de España.

Enrique Areilza Arregui

The life and work of Enrique Areilza Arregui (Bilbao, 1860 - Portugalete, Biscay, 1926), an interesting surgeon from Biscay, has been addressed in two excellent articles published in this journal.[44,45] As one of the pioneers of neurosurgery in Spain, we should highlight his hard work at the miners' hospital in Montes de Triano, a small mountain range in the province of Biscay, where ferrous metals have been mined since Roman times. Enrique Areilza was confronted with miners who had been involved in workplace accidents with extensive head and brain injuries, most frequently after being struck in the frontal region with blocks of stone. He brought together his extensive experience in the work *De las fracturas del cráneo y de la trepanación* (On skull fractures and trepanation).[46] He was particularly interested in the neuropsychological consequences of frontal trauma; sincerely,

the subject matter was not appropriate for deducing precise localisations. However, he made interesting observations, describing patients with marked social disinhibition, mood swings with insipid happiness ("Moria syndrome"), and, in case 11, a patient who incessantly repeated an ejaculatory prayer dedicated to his grandfather (palilalia).[44]

Areilza was a man of contradictory behaviour, sometimes overbearing and aggressive; his most questionable decision was applying pressure to the orbitofrontal cortex in conscious patients to observe the possible clinical changes. He also had undeniable merits: excellent surgical technique, the determination to treat severe brain lesions at a modest local hospital, and an irrepressible interest in clinical research.

Eugenio Díaz Gómez

Though he is included in the Universidad Complutense de Madrid's list of historic Spanish physicians, Eugenio Díaz Gómez (Madrid, 11 May 1892 - Madrid, 5 June 1970) is almost unknown today. He was not a "pure" neurosurgeon, combining this practice with general surgery throughout his life. He was truly convinced of the benefits of simultaneously practising the two specialties. He defended this approach in a 237-page monologue published in 1936, shortly before the outbreak of the Spanish Civil War; in the work, entitled *Seis conferencias sobre el sistema nervioso* (Six lectures on the nervous system), he updated the understanding of neurosurgery, contributing 25 neuroradiological images of his own patients as a key innovation.

Undeniably, Díaz Gómez was thoroughly trained in both specialties, first in general surgery, studying with the most renowned figures of the day, and later in neurosurgery. He was an assistant professor under Julián de la Villa's chair of surgical pathology, and learned vascular surgery with José Goyanes Capdevila (Monforte de Lemos, Lugo, 1876 - Santa Cruz de Tenerife, 1964), himself a student of Alejandro San Martín with recognised experience in the field.[47] Regarding his neurosurgical training, Alberto Rábano Navas' obituary for Díaz Gómez, published in *Archivos de Neurobiología*, pointed to his training under Wilder Penfield at the Montreal Neurological Institute (Canada).[7]

The career of the surgeon and humanist Eugenio Díaz Gómez fundamentally revolved around the Hospital Provincial in Madrid. After a hard-fought competitive examination during the Second Spanish Republic, he won the title of numerary professor of the Provincial Charity, an equivalent position to head of department.[48] He wrote eloquently about Enrique de Isla y Bolumburu (Madrid, 1854 - Madrid, 1929) when surgeons at the Hospital General were obliged by law to attend bullfights, staffing the infirmary.[49] In historical terms, it should be noted that neurosurgery was not officially recognised as a specialty in Spain until 1941, when Díaz Gómez resumed his role after the war.[7] "The first general surgeon dedicated to neurosurgery, the specialty founded at the Hospital Provincial de Madrid," wrote José Álvarez-Sierra.[19(p.199)] The writer and psychiatrist Carlos Castilla del Pino, who in his youth had experienced the ins and outs of the Hospital Provincial, described Díaz Gómez as follows: "short, sturdy, with an enormous chest, arms that reached below his knees, somewhat hunched, with a chin that stood out due to marked prognathism."[50(p.408)] This ape-like image does not correspond with that shown at the Real Academia Nacional de Medicina, of which he was a member. As a denigrating anecdote, he mentions the case of a frontal lobe tumour that was misdiagnosed as being cerebellar, a classic error before neuroimaging became available. It may correspond to the so-called frontal ataxia, described in 1882 by Ludwig Bruns, a form of higher-level gait apraxia.[51,52]

Surgical activity: Eugenio Díaz Gómez may be characterised as an "all-terrain" surgeon. During my time as a neurosurgery intern at Hospital Provincial de Madrid, I had the chance to look through the surgery records book: after one procedure to treat a stomach ulcer, the next patient may have a frontal glioma, etc. An article he published with Navarro Blasco early in the 20th century, in the journal *Los Progresos de la Clínica*, describes two cases of pulmonary hydatidosis, studied in 1919 and 1929, respectively.[53] Most of his neurosurgical publications were published before 1961 in *Hospital General*, and were consulted at the library of Hospital General Universitario Gregorio Marañón.[B]

The monograph *Seis conferencias sobre el sistema nervioso*[6] was completed by Julián de la Villa, in collaboration with José María Villaverde and Eugenio Díaz Gómez. De la

[B]After a state of alarm was declared due to the COVID-19 pandemic on 14 March 2020, the library was converted into an intensive monitoring unit. Five years later, its books remain in storage, ignored but available for consultation. These editions are also unavailable at the libraries of Universidad Complutense de Madrid and of the Official College of Physicians of Madrid.

Villa was chair of anatomy and practised surgery at the Hospital Provincial; his part of the book is illustrated with rough, hand-drawn anatomical diagrams. The neuropsychiatrist José María Villaverde, a member of the Cajal school, died during the Spanish Civil War: he disappeared in September 1936, and his body was never found. His part of the monograph deals with the major neurological syndromes, with a profusion of proper nouns and excessively elemental directions for conducting a neurological examination. The library of the Ateneo de Madrid conserves, so to speak, a very deteriorated copy of this important work, which is well deserving of republication.

Eduard Tolosa i Colomer

With an early calling for clinical neurology, Eduard Tolosa i Colomer (1900-1981) (Figure 7) began his career at the neurology and electrotherapy dispensary at Hospital de la Santa Creu i Sant Pau, in Barcelona. The clinic, founded in 1882 by Lluís Barraquer Roviralta, is considered the first neurology consultation in Spain.[54-56] A year earlier, in 1881, an outpatient neurology dispensary was already in operation, directed by Serafín Buisen Tomati at Instituto de la Moncloa.[13] Tolosa travelled to Paris to train with the paediatric neurologist André Thomas (1867-1963). Upon his return, Lluís Barraquer Ferré encouraged him to learn neurosurgery. To that end, he visited the specialty's most renowned centres: Paris, with Clovis Vincent; Breslau, with Otfrid Foerster; Stockholm, with Olivecrona; and Montreal, with Wilder Penfield. Tolosa lived through the heroic period of Spanish neurosurgery, when tumour localisation was based solely on clinical data; this was unsuccessful in 40% of cases, particularly when the neoplasia involved subcortical regions.[57] Later, Tolosa would be a pioneer of stereotactic surgery in Spain. He was also interested in epilepsy surgery, selecting eligible patients at the Nova Betlem asylum in Sant Gervasi de Cassoles.

His was not the only neurosurgical vocation born at the old Hospital de la Santa Creu. Antonio Raventós Aviñó (Barcelona, 1869 - Barcelona, 1919) had his first experiences of neurosurgery during the Cuban War of Independence; back in Spain, he treated bullfighters. In 1916, he resected a cerebellar tumour, possibly a sarcoma, in an operation indicated by Lluís Barraquer Roviralta. Some patients with cerebral cysticercosis are also known to have undergone surgery at this distinguished centre, with operations performed by Salvador Cardenal Fernández (1852-1927), a surgeon from Valencia who trained in Paris with Paul Broca.



Figure 7. Eduard Tolosa i Colomer. Source: Banco de Imágenes de la Medicina de España de la Real Academia Nacional de Medicina de España.

Wenceslao López Albo

Wenceslao López Albo (Santander, 1889 - Mexico City, 1944) obtained his medical degree in Valladolid, then moved to Universidad Central to pursue his doctorate. He met Nicolás Achúcarro and Luis Simarro at Cajal's Laboratorio de Investigaciones Biológicas, and Miguel Gayarre at the Ciempozuelos asylum, where the latter was director at the time.[3] These experiences awakened his interest in nervous system diseases. He trained with Pierre Marie at La Salpêtrière from 1925 to 1927, completing his neuropsychiatric training in Germany with Lewandowski, Fedor Krause, Hermann Oppenheim, and Karl Bonhoeffer (*Diccionario biográfico de médicos españoles*). In Breslau, where Otfrid Foerster was born and died, he followed Foerster's example, simultaneously



Figure 8. Medal commemorating Otfrid Foerster and Pío del Río Hortega, for the International Congress of Neurology held in Barcelona from 8 to 15 September 1973. Source: MAH SEN.

practising neurology and neurosurgery (Figure 8).[58]

Back in Spain, he led an outpatient neurology consultation at Hospital de Basurto, in Bilbao. Advised by Gregorio Marañón, the marquess of Valdecilla designed an exemplary hospital in Santander in 1928, with a team of distinguished physicians; López Albo directed the neuropsychiatry department. His disagreement with the marchioness of Pelayo, who refused to accept lay nurses, forced López Albo to resign. In 1931, he was reinstated, in the light of the prevailing political winds. During the Civil War, López Albo and his family were forced into exile after Santander was captured by the insurgent Nationalists in 1937; after a long journey, the family eventually settled in Monterrey, Mexico. He was accepted at the city's university as a professor of neuroanatomy, neurology, and psychiatry. He is still remembered for the imprint he left of Cajal and his school.[59]

In 1941, a group of exiled Spanish physicians in Mexico gathered around Lafora with a view to establishing a private neuropsychiatry institute.[60] At an old mansion at number 61, Calle Abraham González, in Mexico City, they installed an electroencephalography system that Dr Case had brought from Chicago, as well as a neuroradiology machine, provided by Sánchez Pérez, who was interested in cerebral angiography. The final member of the group was the neurosurgeon Sixto Obrador Alcalde (Santander, 1911- Madrid, 1978), who had worked with Lafora at the old Cajal Institute, located in San Blas at the time. López Albo subsequently moved to the Sanatorio Español, an institution run by the Sociedad de Beneficencia Española in Mexico City, where he worked for a year.[60]

López Albo left an impressive body of written work: some 150 articles, mainly addressing neurological subjects, including numerous studies on parasitic diseases of the nervous system. Many of these were recently collected by the journals *Gaceta Medica del Norte* and *Revista Clínica de Bilbao*, the publications of the Bilbao Academy of Medical Sciences.[61] López Albo's role as a clinical neurologist seems clearly to have predominated over his neurosurgical abilities. Sixto Obrador, with whom he coincided in Monterrey, considered him "meticulous, honourable, a good neurologist and a mediocre surgeon." The latter may be the reason for which he delegated to Sebastián Chauna, a member of his department, the responsibility for operating on patients with lumbosacral malformations and subdural empyemas.

Ricardo Bueno Ituarte

It is possible that the tragic death of Ricardo Bueno Ituarte (Motrico, Guipuzkoa, 1904 - San Sebastián, 1956) (Figure 9) may have contributed to the silence surrounding his memory, even among those close to him: a distinguished San Sebastián family in which his father, also a physician, was director of the tuberculosis sanatorium of Nuestra Señora de las Mercedes.[62] In Madrid, between 1920 and 1924, Ricardo Bueno was trained by Gregorio Marañón at the Institute of Medical Pathology and by José Sanchís Banús, head of the neurology and psychiatry department (the affiliation he provided for his articles) at the Hospital Provincial. Both men impressed upon him their liberal disposition, inclination towards the nervous system, and dedication to republicanism. In an article in his institute's official publication, Marañón recalls Bueno as an excellent clinical neurologist[63]:

> One of our most exact and insightful physicians […] one of our great specialists […], when we read the histories of patients studied by him, it is difficult to imagine such systematic, well-informed, and

modern neurological examinations as his […].

Like so many neuropsychiatrists of the Generation of '27, he made what he saw as the obligatory visits: La Salpêtrière, in Paris, with Georges Guillain, Théophile Alajouanine, and the neurosurgeon Thierry de Martel; and Breslau, in Germany, with Otfrid Foerster. After his return to Spain, his neuropsychiatric practice received patients whose only apparent hope was surgical intervention, and he thus became the first neurosurgeon in Guipuzkoa, as he was announced at the Clínica Operatoria de San Ignacio in San Sebastián. On 6 December 1930, he presented a communication to the Medical-Surgical Academy of Guipuzkoa entitled "Estado actual de la cirugía en los tumores del cerebro" (Current status of brain tumour surgery): he was hoping to draw attention to his new career and his mastery of the subject. He was unable to overcome his failure in a politicised competitive examination in which the favoured candidate was the psychiatrist and successful writer Luis Martín Santos (Larache, Morocco, 1924 - Vitoria, 1964).[C] Ricardo Bueno was plunged into a deep depression, and took his own life. Like the novel by his opponent Martín Santos, the details of Ricardo Bueno's death remain in a time of silence.[64]



Figure 9. Eduardo Bueno Ituarte. Source: MAH SEN.

Discussion

From barbers to surgeons

Barber-surgeons appeared in the Middle Ages as low-level professionals whose practice was limited to the manual treatment of external lesions, bloodletting, extracting teeth, and attending childbirths. Lacking any great technical knowledge, their practice was prohibited in 1215 by Pope Innocent III. Human dissection is known to have been forbidden until the Renaissance; the lifting of this ban enabled the training of surgeons with good understanding of anatomy and regulated surgical practice.[65] In Spain, the study of surgery began during the reign of Carlos III, with the creation in 1748 of the Royal College of Surgery of Cádiz, supported by the influential marquess of Ensenada (1702-1781). The first students were trained as interns under Pedro Virgili. Their destiny was to join the Navy, which had a pressing need for able surgeons in the war. Years later, in 1760, Virgili created another Royal College in Barcelona, following the same model.[66] Until 1799, physicians and surgeons followed separate courses of study, until Pedro Castelló y Ginestá (1770-1850), the personal physician of king Fernando VII, merged the two.[67]

Most of the surgeons addressed in this article practised in the final years of the 19th century, with six being born between 1840 and 1860. They were preceded by such noteworthy surgeons as Argumosa, Federico Rubio, and González Velasco, among others. Doubtlessly, there were experts before them who treated head and brain lesions and used ad hoc instruments, such as the trephine. In this regard, we should mention Andrés Alcázar (Guadalajara, ca. 1500 - Salamanca, 1584), who

[C]The life of Luis Martín Santos was marked by the success of *Time of silence*, the sombre atmosphere of post-war Madrid, the paradox of being the son of an army surgeon on the Nationalist side but joining the socialist party and suffering numerous arrests, and the tragic sudden deaths of his infant son and of his wife, Rocío Laffón. He died at a young age in a traffic accident, close to Vitoria (E. Bravo. *Vanity Fair*, 21 January 2024).

practised as a physician and surgeon in the provinces of Ávila, Segovia, and Salamanca between 1573 and 1578, subsequently becoming the chair of surgery at the medical school of Salamanca. He mentions this in his treatise on medicine and surgery, published in 1575.[68-70] More recently, the literary councils of the Royal College of Surgery of San Carlos, founded in 1780 by the renowned surgeon Antoni Gimbernat, evaluated works presented by aspiring surgeons. The titles of their dissertations were patiently noted down by Manuel Usandizaga Soraluce (San Sebastián, 1898 - Barcelona, 1982), an old free student at the medical school of Madrid. The authors of some documents held at the National Library of Spain refer to the use of trephines, cranial fractures, and ablation of parts of the cranial vault.[71] Alongside Andrés Alcázar, these would be the earliest precursors of neurosurgery in Spain.

Scientific revolution and recovery

Our protoneurosurgeons were the heirs to the revolution of 1868, a period of significant scientific recovery[66]: the anatomist Juan Fourquet pioneered the use of the microscope; Pere Mata i Fontanet (1811-1877) created forensic medicine; and Francisco Méndez Álvaro (1806-1883) founded *El Siglo Médico*, a weekly publication whose pages attracted contributions from the wisest physicians. Anaesthesia with ether and chloroform was already available, having been introduced by Diego de Argumosa y Obregón,[11] and specialists were beginning their careers, such as the urological surgeon Melchor Sánchez de Toca.[72] However, it was not all roses: the dedicated surgeon Pedro González Velasco (1815-1882) explained the difficulties of the period[73]:

> We must banish from our surgical clinics the flippancy with which we proceed to operate […], where darkness reigns over disease […], and we must stay the hand of the carpenter-surgeon: that is the name I give to those who see only the saw, the chisel, and the hammer when faced with a surgical pathology […]. The last and the simplest operation that I perform always puts me on guard and makes me wary; I have always been mistrustful when operating.

The contributions of the pioneers of Spanish neurosurgery

The most common intervention at the time was the lifting of depressed skull fractures, which was frequently performed in the miners treated by Enrique Areilza, in 1887. As explained in Eulogio Cervera's monograph on "surgical neurology" (a fortunate term adopted by contemporary neurosurgeons), the most frequent injuries in rural settings were from horse kicks or bullfighter's *banderillas*. Infection of small scalp wounds could lead to severe intracranial abscesses. Cervera saved the lives of some patients with timely drainage of the abscesses and washing with salted water. We should note the mysterious case of a woman who, despairing due to unbearable headache, was cured after Cervera ablated a restricted area of the skull with marked thickening, substituting the diploë with a metal prosthesis. We may speculate that the patient had circumscribed cranial osteomyelitis, a process that was occasionally observed in the 1960s.[D] Cervera also pioneered the practice of end-to-end suturing of peripheral nerves sectioned in traumatic injuries. However, surgical treatment of brain tumours was exceptional; Berrueco operated on a tumour involving the cerebellar hemispheres,[2] and San Martín treated a patient with probable multiple metastases. Finally, Ribera i Sans was the founder of paediatric surgery at Hospital del Niño Jesús, and the only one to operate on the spinal cord.[15] We should also underscore the key article published in 1936 by Eugenio Díaz Gómez, which contains numerous neuroradiological images, a milestone marking the beginning of modern neurosurgery.[6]

The role of neurologists in the early years of neurosurgery

Federico Rubio y Galí did not hesitate to install an outpatient neurology clinic at the Instituto de Terapéutica Operatoria. The clinic was directed by Serafín Buisen Tomati,[13] a neurologist who was familiar with the latest specialist literature, who encouraged Manuel Otero Acevedo to specialise in surgery of the nervous system.[2] He advised Eugenio Cervera in the diagnosis of his patients, and even advised Federico Rubio, the

[D]I recall the case of a patient with cranial osteomyelitis when I was an intern at the neurosurgery department of Hospital Provincial (a position requiring a successful competitive examination). After successive ablations, he was left without the calvaria, with a large section of the dura exposed, protected only by a capeline.

institute's director and owner, to operate on a patient with post-traumatic epilepsy.[11] This was the "heroic period of neurosurgery,"[57] when diagnosis was based on semiology and only 40% of the expansive processes observed post mortem were diagnosed. In 1894, San Martín had the good fortune of working with Simarro, who had become an expert neurologist after five years in Paris; together, they tried, without great success, to localise two probably subcortical metastases.[33]

The bases used by European pioneers of epilepsy surgery, such as William Macewen, Rickman Godlee, and Victor Horsley, were no different.[74,75] They knew the localising value of aphasia thanks to the observations of Paul Broca,[76] which led Cervera to drain an epidural abscess. Eugenio Díaz Gómez made a very significant point about tumours: "good examination by a competent neurologist is essential." His relationship with Alberto Rábano Navas (1923-1975) went beyond close collaboration. Rábano's eulogy of Díaz Gómez, published in *Archivos de Neurobiología* after he died, described him as "honest, intelligent, intellectually generous" and thanks him for "pushing forward the delayed specialty of neurology." He continues: "we suffer the bitterness of seeing his departure met with the greatest official indifference from that hospital for which he lived and for which he would die." Furthermore, when he was confined to bed after a femoral head fracture, he was not visited by the disciples who had begun their careers in the specialty under him, such as Pedro Albert, Pedro Urquiza, and Pablo Peraita.[77]

We might ask a delicate question: why did some young neurologists decide to move to neurosurgery? It is not hard to suppose that it was out of necessity, the frustration of having no more to offer. Tolosa i Colomer was encouraged to do so by the Barraquers, that distinguished family of neurologists from Barcelona. He was followed by others: Areilza Arregui,[62] López Albo,[59] and Bueno Ituarte.[62] This phenomenon was not limited to Spain: Babinski is known to have been particularly proud of having inspired Thierry de Martel (1875-1940) and Clovis Vincent (1879-1947) at the old La Pitié hospital in 1906.[78] Thierry de Martel crossed the English Channel every Monday to watch the operations of Victor Horsley (1857-1916), the British pioneer of neurosurgery, at the National Hospital on Queen Square. He could not tolerate the invasion of Paris by German troops in 1940, and decided to take his own life.[79] Otfrid Foerster (Breslau [German], 1873 - Wrocław [Polish], 1941), a staunch defender of the individuality of neurology, was influenced by Carl Wernicke to become a neurologist and travel to Paris to study with Babinski and Pierre Marie. Due to the lack of a cure for the severe spasticity in spastic diplegia, he performed sectioning of the posterior root, as well as anterolateral cordotomy to treat the unbearable pain in tabes dorsalis, one of his most original contributions. He combined neurology and neurosurgery throughout his professional life.[80,81]

In conclusion, it should be noted that, despite its precarious beginnings, which were not so long ago, Spanish neurosurgery today is in rude health: in 2005, the specialty was practised at 18 public and private hospitals in Madrid.[82] According to data published by the Ministry of Health, of the 9007 medical resident positions in the 2025 call, 131 (6.5%) were assigned to neurosurgery, distributed across 37 Spanish cities (eight in Madrid and three in Barcelona). In comparison, 190 (9.4%) went into the specialty of neurology. It remains to be seen if these comparative figures are appropriate for the demand for care in each specialty.

Conflicts of interest

The author has no conflicts of interest to declare.

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