



# Jean-Alexandre Barré (1880–1967): his detection sign of subtle paresis due to pyramidal deficit (1919) and his work in line with that of Giovanni Mingazzini (1859–1929)

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## Abstract

This is a paper about the development of a sensitive examination of subtle motor pyramidal deficits. Jean-Alexandre Barré's life and work are reappraised, and also his milieu prone to increase his clinical skillfulness and sharpening many motor maneuvers on subtle motor deficits (1919, 1920, 1937). Giovanni Mingazzini is also remembered by his precursor publication of “small signs” about organic paresis (1913), and by his neuroanatomical background, in an Italian Neuropsychiatric milieu, at the time.

**Keywords** Neurology · World War I · Pyramidal deficit · Paresis · Barré's sign · Mingazzini's sign

## Introduction

The neurology in France at the nineteenth century and the beginning of the twentieth century gravitated around Paris, and Jean-Alexandre Barré's professional path reinforces this view. He received his medical education in Nantes, in his native town, but he gained neurological strength in Paris, and after, he was appointed professor of neurology in Strasbourg. This French neurologist is best known for an early description of acute immune-mediated inflammatory polyradiculoneuropathy (Guillain-Barré-Strohl syndrome), and also for his “Manoeuvre de la jambe” (1919)—Barré's leg test—a search maneuver for suspected lower-limb weakness [1–5].

In Italy, at the beginning of the twentieth century, the Neuropsychiatry flourished, and its eminent figures played important roles in the development of the clinical neurology, among them, Giovanni Mingazzini, one of the main founders of the Italian neurology [6–9]. He published his work on the

“small signs” of organic paresis, of special interest on this paper [10].

Linking the French neurology and the new Italian neurology, there is Barré's concerted work with that of Mingazzini regarding muscular strength overall assessment of legs, and, also, arms.

## Barré's life and career

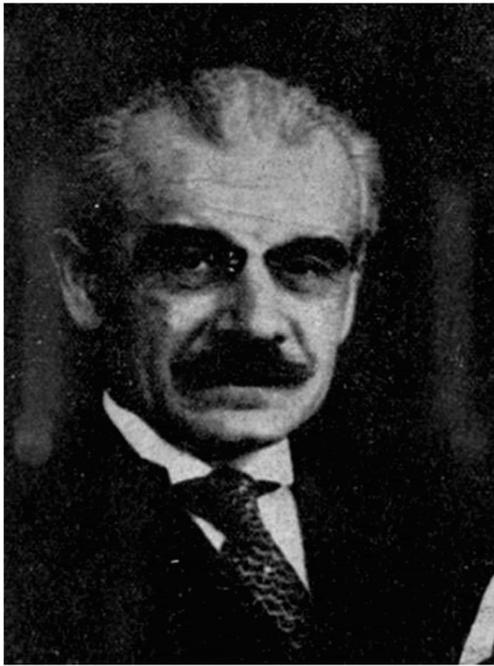
Jean-Alexandre Barré (Fig. 1), after his medical education in Nantes came to Paris, where he successfully applied for an internship. It was during that time that when he met Joseph Babinski (1857–1932), he abandoned his surgical plans. He completed his medical training under the supervision of Alexandre-Achille Souques (1860–1944) and Pierre Marie (1853–1940). In 1912, he attained his doctorate degree for an original thesis entitled “Les Ostéoarthropathies du Tabes. Étude Critique et Conception Nouvelle” (“Osteoarthropathies in spinal syphilis. A critical study and a new conception”) [2].

At the occurrence of World War I, Barré began his military service as a member of a front-line ambulance unit, but he was later engaged to hospital work within a neurological unit of the Sixth Army, in the northern region of France, headed by Georges Guillain (1876–1961). Afterwards, in 1917, Barré was allotted to the military neurological center in Nantes; and in 1918, with the end of the war, he gained a position as Director of the Neuropsychiatric Military Center, in the

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**Fig. 1** Jean-Alexandre Barré (Nantes, May 25, 1880–Strasbourg, April 26, 1967). Source: [https://en.wikipedia.org/wiki/Jean\\_Alexandre\\_Barré#/media/File:Professeur\\_Barré\\_Strasbourg.jpg](https://en.wikipedia.org/wiki/Jean_Alexandre_Barré#/media/File:Professeur_Barré_Strasbourg.jpg)

Eastern Region of France [2]. Besides, in the next year, he was appointed professor of neurology in Strasbourg [2].

Barré and Guillain became friends and they developed a long-term association, the most acclaimed in 1916, during the World War I. At this time, they both with André Strohl (1887–1977), all serving in the Neurological Centre of the French Sixth Army, observed that two soldiers, who were suffering from muscular weakening and pain with paresthesias had a surprising quantity of spinal fluid protein [4]. Strohl performed the electrophysiological tests. Consequently, the report by these three authors was the first supported by both cerebrospinal fluid analysis and the newly emerging techniques of electrophysiological studies [2, 4].

At this war time, it was highly emphasized the importance of the differentiation between functional vs. organic causes of the motor deficit [4]; consequently, Barré advised against quickly ascribing the symptoms observed to psychological causes, and suggested a careful neurological examination of each patient. In close partnership with Guillain, he also studied the clinics of numerous cases of peripheral and central nervous system trauma lesions [2, 4]. Later, in 1920, Guillain and Barré published a six-chapter book about their experiences in the war neurology, with a preface by Pierre Marie (*Nervous semiology, Wounds of the Brain, Wounds of the Spinal Cord, Concussion Without External Wounds Resulting*

from the Explosion of Shells, Pathology of the Cranial and Spinal Nerves, *Varia*) [4].

Barré was a fine clinician, with meticulous clinical examination, besides a productive author, and his particular interest was in vestibular function and related diseases; in consequence, he founded the *Revue d'oto-neuro-ophthalmologie* [2]. His vivid academic and clinical practice made his name assigned to Guillain-Barré-Strohl syndrome, as already presented in this paper, besides Barré-Liéou syndrome [3], and other disorders. In relation to Barré's sign, the test he established to detect slight pyramidal paresis will be discussed in the final section.

Barré retired in 1950, but he suffered a stroke (1953), which left him dysphasic with lasting hemiparesis [2, 3]. This initial event happened when he was traveling home from a congress in Lisbon, and he died many years later, 1967, in Strasbourg [2]. Regarding his leisure time, Barré appreciated classical music and both his daughters were educated in music; besides, his first wife, who died young, was a proficient pianist [2].

### Giovanni Mingazzini's life and career

Giovanni Mingazzini (Fig. 2), was born in Ancona, on February 15, 1859, and he earned his MD degree from l'Università di Roma "la Sapienza" (1883). Immediately after graduating, he served as a doctor at the Arcispedale S. Giovanni, and in the same period, he conducted cerebral morphology and anthropology investigations at the Experimental Psychology Laboratory. Then, he stayed for 2 years in Munich at the school of German neuroanatomist and psychiatrist settled in this city, Bernhard von Gudden. Subsequently, he followed an academic career [6, 7, 9], and he obtained a teaching post (*Libera Docenza*) in Normal Human Anatomy, in 1889, and few years later, the one in Neuropathology and Psychiatry [6, 9]. Lastly, in 1921, succeeding Augusto Tamburini, professor of the Psychiatric Clinic, Mingazzini became director of the new Nervous and Mental Diseases Clinic, holding it until his death [8, 9].

In this way, Mingazzini is considered the founder of the Roman neurological school. In short, Mingazzini was appointed professor of psychiatry and neurology at the University of Rome; but at the contrary of Barré, a fine clinician, he is mainly known for his anatomical research on the nervous system, and he devoted himself, among other issues, to the study of the lenticular nucleus and of the prelenticular region, defining a new acute putaminal syndrome also called "Mingazzini's lenticular hemiparesis." Afterwards, Henschen, referring to the small presupralenticularis region, named the defined region, as "Mingazzinisches Feld" [6].



**Fig. 2** Giovanni Mingazzini (Ancona, Italy, February 15, 1859—Rome, Italy, December 3, 1929). Source: <https://upload.wikimedia.org/wikipedia/commons/thumb/c/f/Mingazzini.jpg/220px-Mingazzini.jpg>

Mingazzini's "Trattato di Anatomia Clinica dei Centri Nervosi" ("Treaty of Clinical Anatomy of the Nervous Centers") (1912–13) set out a methodology in clinical neurology that would be developed and refined over time. Mingazzini was also very keen on Neuropathology; in this way, he published a book of "*Lezioni di Neuropatologia*" ("*Lessons of Neuropathology*") (1905). In addition to its own value that places the first mentioned book among the most important works of Italian neurology, it is the cornerstone of Mingazzini's scientific and cultural orientation in Neurology [6, 8, 9]. In conclusion, Mingazzini enjoyed great international renown, and even received the brain of Lenin for examination following the Soviet leader's death, in 1924 [6, 8]. In Brazil, he presented (1927) a conference about "Gli aspetti più importanti del problema del sistema motorio extrapiramidale" ("The most important aspects of the extrapyramidal motor system problem"), in this way, his anatomical approach to the clinical neurology [11].

Regarding his way of life, he could be engaged in a professor's life model, as he spent most of the day studying and writing, as quoted by Alemà [6]. His Italian background is linked to the German one, by marriage and also the neuroscience. Regardless of his well-known good nature, Mingazzini was meticulous and combative, as mentioned also by Alemà [6]. However, when Benito Mussolini rose to supremacy in Italy, Mingazzini rejected to sign a commitment to Fascism,

thus exposing himself to deportation to Sardinia. Apropos of his end of life, he died of a heart attack in 1929, at the age of 70 years old [1].

### Overall assessment of muscle strength

The assessment of muscle strength is an indispensable part of the neurological examination. Consequently, the symmetric scrutiny of the segmental force is useful and important. In addition, there is the force confrontation, of a global vision of the regional strength, to detect subtle lesions, usually done with simple comparative maneuvers on one side in relation to the other. These last ones are the main subject of the maneuvers of Mingazzini and Barré (Figs. 3 and 4).

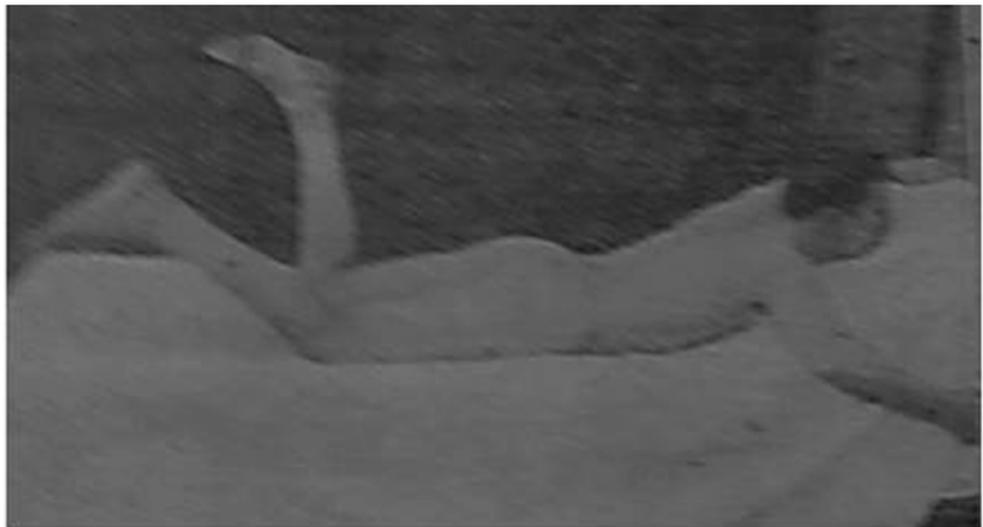
In 1919, Barré described a new leg drift test with a patient lying on the abdomen, for suspected lower-limb weakness: as a patient tries to maintain both legs separately at a 90° angle from the bed, the extremity on the paretic side will lower (Fig. 4) [5]. Barré warned against false positive interpretations of the test in the case of the painful restriction of leg joint mobility. In this publication (1919) entitled "The manoeuvre of the leg. A new objective sign of paralysis or paresis due to disturbances of the pyramidal tract," Barré emphasizes the Babinski's role (1896–1900) on the differential diagnosis of organic and "pithiatic" paralysis, when a series of objective signs differentiate them. In the next year (1920), apud Owecki et al. [2], Barré presented a maneuver to identify the pyramidal weakness of the upper extremities by outstretching the arms with the palms facing each other and the fingers spread, once again presented in his publication of 1937 [12].

It is remarkable that Mingazzini is frequently remembered when it is mentioned Barré's signals, of leg or arm; in this way, Mingazzini is also a reference in the area of examination of subtle motor impairment.



**Fig. 3** Mingazzini's arm test published in 1913, now more commonly named Barré's test. From ref. 10.

**Fig. 4** Barré's description of his leg sign (1919). From ref. 5—  
“Very light Hemiparesis.  
Maneuver of the leg, positive”



The paper of 1913 “On some “small signs” about organic paresis” [10] presents the related experience of the Migazzini's School: Two of them related to the face, the third to the upper limb, and the fourth to the lower limb. Figure 3 demonstrates his sign of the oath. He also wrote about this kind of maneuver in the lower limb: “The position which is made to take on the subject is that of the supine decubitus. He is asked to keep his legs spread and lifted above the plane of the bed, so that they form with it an angle of about 45 degrees”.

What is referred to as the Barré's arm test was actually first described by Mingazzini, as seen in Fig. 3. It was performed with the arm fully extended in all joints with wrists straight [13].

In the Barré's large paper published on 1937 about “The pyramidal deficit syndrome” [12], he starts paying homage to Babinski and he summarizes the related maneuvers, what was similarly already done by Mingazzini, in 1913 [10]. Barré talks about “the maneuver of the leg” (prone position) by him and by Mingazzini (supine position), besides other deficit maneuvers of the upper limb, also by both authors; he likewise mentions the signals of the face (central and peripheral orbicular signs). Barré as well proposed a novel variant of the supine leg drift test by Mingazzini, to be carried out with the lower extremities flexed 90° at the hips and knees. It is to be remarked that Mingazzini's maneuver was originally performed with the patient in the supine position with both legs raised straight in a 45° angle from the bed.

Similarly, in the same paper (1937), Barré presented the arm drift test previously presented by Mingazzini [12]. Barré noticed that in pyramidal syndromes, a paretic arm not only gradually lowered, but also lost its initial extended position and became slightly flexed at the joints. Thus, the test still performed today in neurological practice, which was originated by Mingazzini, but then adopted and broadly described by

Barré has generally been referred to as the Barré's test [2]. Barré claimed that paresis in the central lesion is more marked distally which would favor the sensitivity of the “signe de l'écartement” in opposition to Mingazzini's arm sign [1]. Indeed, the melt of these signals is very useful what is the case of the “signe de la main creuse” (hollow hand sign) by Garcin where there are adduction and flexion of the thumb when the fingers are extended voluntarily. Indeed, it is a combination of both original Barré's and Mingazzini's arm signals [1]. Regarding the pronator arm effect visualized in these maneuvers when the forearm/hand is supinated, many physicians noticed it such as Babinski, Strümpell, and Kinnier Wilson, as mentioned by Koeler et al. [1].

With plenty of maneuvers to study subtle weakness due pyramidal deficit, it would be worth to know their accuracy. Teitelbaum et al. [13] studied the test accuracy of straight arm raising (arms out plus wrists dorsiflexed), pronator drift, adapted Mingazzini's leg maneuver, finger tap, forearm roll, and segmental strength, besides deep tendon reflexes, in 170 patients with (86) and without (84), a proven lesion in the motor areas confirmed by computed tomography. The mentioned authors state that the detailed segmental examination has very good specificity (97.5%) for detecting motor deficits, but poor sensitivity (38.9%). Pronator drift with finger tap and reflexes could substitute the segmental motor screening examination for subtle motor lesions, as shown by Teitelbaum et al. [13]. More specifically, an abnormality of pronator, reflexes, or finger tap had a sensitivity of 97%, and they altogether positive, specificity was 97% [13].

In conclusion, Barré's and Mingazzini's schools developed the initial sensible maneuvers of global muscular strength adapted along the time. Nowadays, learning from the masters, during muscular strength evaluation, the overall assessment is more sensible to detect subtle motor deficits than segmental evaluation (muscle by muscle). The maneuvers include the

following: in the lower limbs—Mingazzini’s maneuver adapted by Barré (supine, thighs vertical, legs horizontal) and Barré maneuver (prone position, legs at the vertical); in the upper limb—straight arm raising (Mingazzini-Barré), pronator drift and finger taps.

### Compliance with ethical standards

**Conflict of interest** The author declares no conflict of interest.

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