
Joseph Félix François Babinski (1857–1932; Fig. 1) published only a single article in Brain. This was the text of a lecture delivered at the Royal Society of Medicine, London, ‘with presentation of cases and cinematograph films’. At the time Babinski was 65-years-old and had just relinquished his position as chief physician at the Pitié hospital. Probably, the occasion of his London lecture was intended as a tribute to the man who, having floundered decades before in the politicized rat race of Parisian academia, had devoted most of his career to a persistent study of neurological signs. This had culminated in the discovery of the ‘toe phenomenon’ (‘phénomène des orteils’) in 1896. Babinski’s main motive had been to distinguish organic disease from what was then called hysterical paralysis (conversion disorder in current parlance).

The printed text of Babinski’s lecture contains no illustrations, but the lack of images is more than made up for by its lyrical aspects: it is the only article ever published in Brain in the French language, and one of the very few to start with a literary quotation. Babinski’s opening paragraph reads:

‘GENTLEMEN - I happen to have overheard the telling of the following anecdote: The great Spanish knight to whom Cervantes has dedicated his book Don Quichote, is travelling in France and arrives at a late hour in a village, where he plans to spend the night. He rings the bell at an inn, where the owner, before opening the door, demands to know whom he is dealing with. The nobleman recounts his names: Duke of Bejar, Marquess of Gibraleon, Count of Bahalcazar and Ban~ares, Viscount of Puebla de Alcocer, Sire of the villages of Capilla, Curiel and Burguillois. The innkeeper, not knowing that a Spaniard might have six or seven different names, responds: “Gentlemen, you are with too many - I cannot accommodate you”; he leaves the knight on the street and so deprives himself of a guest who might have procured him great profit.’

A similar misadventure, Babinski continues, may befall the unwary student of medicine who is trying to master the reflex phenomena of the lower limbs: defence reflexes, antagonistic reflex of Schaefer, ‘Unterschenkelphänomen’ of Oppenheim, dorso-plantar flexion reflex of Bechterew, triple withdrawal of the leg, phenomenon of the shortening muscles, reflexes of medullary automatism, mass reflex. Not knowing that all these descriptions have to do, at least largely, with only a single phenomenon, and believing himself incapable of accommodating in his mind all those subjects he regards as different, he gives up on the inquiry and thus deprives himself of a notion that is easy to understand and of great practical value.

Babinski continues by describing the reflex movements as they can actually be observed on stimulation of the foot. For didactic purposes, he begins by leaving the response of the toes out of the equation. The stimulus may consist of scratching the skin with a needle, or by pinching the skin as well as deeper structures such as the Achilles tendon, or by forcefully flexing the toes downward. The response is always the same: apart from contraction of the fascia lata, one sees flexion of the foot towards the leg, of the leg towards the thigh and of the thigh towards the pelvis (triple flexion). The intensity of the response is variable between normal subjects, only partly depending on the intensity of the stimulus. In patients with a lesion of the pyramidal system, the response is slower, more prolonged and of greater amplitude than in normal people. A qualitative rather than a quantitative difference is that dorsiﬂexion of the foot obtained by stimulation outside the sole of the foot is a sign of disease. Babinski even ventures, at the risk of discouraging the imaginary student to whom he refers in the introduction, to give the sign a name: ‘signe de la flexion réﬂexe du pied’. The difference between reflex movements and voluntary retraction of the leg is the contraction of the tensor fasciae latae muscle, which occurs only with the former.

Having defined the phenomenon of triple leg flexion, Babinski turns to the relationship between this synergistic reflex and ‘his’ extensor response of the toes, which he consistently designates as ‘phénomène des orteils’. In his earliest publications after the seminal 1896 paper, Babinski had been adamant that the normal response, plantar ﬂexion of the toes, is part of the ﬂexion synergy of the lower limb. In contrast, he views the pathological extensor response as a disturbance (‘perturbation’) of the normal response, a phenomenon in its own right, not related to any other physiological or pathological event. His publications evoked an avalanche of articles by others, with comments or new observations on the...
toe phenomenon (see van Gijn J, The Babinski sign - a centenary. Utrecht University, 1996). Some of these offered cogent arguments for a different view on the pathophysiology of the plantar reflex. Prominent among these were, first, Pierre Marie and Charles Foix (Les réflexes d’automatisme médullaire et le phénomène des raccourcisseurs; leur valeur sémiologique, leur signification physiologique. Rev Neurol 1912; 23: 657–76) and subsequently, in 1914, Francis Walshe. At the time of writing his first Brain article, Walshe, later editor of the journal between 1938 and 1954, was 28-years-old and an aspiring neurologist; his appointment to the staff of the National Hospital would not materialize until 1921. The essence of both papers is that anatomists have misnamed the toe muscles, since contraction of toe ‘extensors’ shortens the leg, whereas plantar flexion of the toes lengthens it. This is especially clear in animals (Fig. 2). Both Walshe and the French authors lean heavily on Sherrington’s findings in spinal animals and emphasize the analogy between his work and the phenomena in patients with lesions of the pyramidal system. In other words, it is pathological toe extension, the Babinski sign itself, which is part and parcel of the flexion synergy of the leg. Lesions of the corticospinal pathways cause disinhibition of the flexor synergy, including activation of the ‘extensors’ of the toes, other than in normal circumstances. Walshe differs from Marie and Foix only in that he regards contraction of the hamstring muscles and not of the toe extensors as the initial and minimal reflex response (‘motor focus’), though sometimes only noticeable by palpation (‘The “extensor” type of plantar response never occurs without evidence of reflex contraction of more proximally situated flexor muscles, notably the hamstrings’).

Similar views on the pathophysiology had been expressed as early as in 1900 by Van Gehuchten, from Louvain (Réflexes cutanés et reflexes tendineux. Rev Neurol 1900; 8: 736–9; Considérations sur les reflexes cutanés et les reflexes tendineux. Journal de Neurologie 1900; 5: 471–8). Van Gehuchten had added that the normal (downward) response of the toes was not ‘transformed’, but that it disappeared when the corticospinal fibres were affected, in the same way as was already known to occur with the cremasteric and abdominal reflexes. Babinski had strongly opposed the opinion of his Belgian colleague, but he relents somewhat two decades later, in London. Incidentally, van Gehuchten had died there unexpectedly in 1914, soon after his flight from the flames of Louvain. Babinski, though now admitting to strong ties between the ‘toe phenomenon’ and the triple flexion response of the leg, maintains that these ties are not ‘indissoluble’.

In defending his stronghold, Babinski falls back on a number of well-worn arguments, even though in the meantime these had been undermined by others, especially by Walshe in his 1914 paper. One part of Babinski’s argument consists of three case reports in which plantar flexion of the toes occurred together with the flexor synergy of the leg. These issues do not deserve to be laboured in detail; the upshot is that the observed phenomena might be explained by contractures in two cases, and by a combination of flexor and extensor synergies in a third, paraplegic patient. The other part of Babinski’s position rests on what happens after application of a tight rubber band (‘Esmarch’s bandage’) below the knee: the triple response of thigh, leg and foot remain, but the big toe no longer goes up. Babinski largely ignores the explanation provided by Marie and Foix, supported by Walshe, that this is only to be expected when the long toe extensor is made ischaemic (or, one might add, the peroneal nerve...
compressed). He professes: ‘restricting myself simply to the field of observation,....I wished to establish that there could be a disso-
ciation between these two phenomena’.

Subsequently, Babinski gives a brief historical account of the flexion response, mentioning Prochaska, Schiff, Vulpian and Brown-Se´quard, but not Marshall Hall. He recounts how the inter-
est for the older, exteroceptive reflex response waned after the discovery of tendon jerks (in 1875, independently by Erb and Westphal) but was renewed after the discovery of the ‘toe phe-
nomenon’. In compressive lesions of the spinal cord, he has found
that the upper border of the area on the trunk from where one
can evoke the combined motor response allows a topographical
diagnosis and successful removal by operation—to which he modestly adds that such a feat will hardly cause surprise in the land of the illustrious Horsley, whom he is proud to have counted among
his friends. The finding that after the operative cure the ‘defence
reflexes’ return to a modest level, instead of the intense flexor spasms beforehand, inspires Babinski to an historical metaphor,
though not entirely accurate: the spinal cord has for some time
been freed from the yoke of higher centres, but like liberated
slaves in ancient Rome, its liberty is transitory and it may well
find itself again enchained.

A large part of Babinski’s discourse, as well as Walshe’s 1914
paper, is devoted to a comparison of flexor and extensor
energies, touching on physiological, semiological, phylogenetic
and even teleological aspects. After almost 100 years, those dis-
cussions have lost much of their appeal. That does not apply to
the 1956 paper of Walshe, now Sir Francis and 70 years of age.
From the heights of the neurological Olympus, he throws his thunderbolts at a few young heretics who have had the temerity
to question the relationship between lesions of the pyramidal tract
and the sign discovered by Babinski (who died in 1932). Walshe is
of course right in that the absence of Wallerian degeneration does
not imply normal function. And his renewed assertion that he had
never seen a truly isolated Babinski response serves to remind us
of the intimate relationship between the ‘extensor’ toe response
and combined flexion of the leg. Awareness of this relationship
not only improves understanding but is also of great practical
value. Even in the era of neuroimaging, students should be
taught not to stare at the toes alone when they elicit the ‘réflexes
de défense’. An upgoing big toe, in unison with contraction of the
other shortening muscles of the leg, is still an infallible sign that
weakness cannot be attributed to conversion disorder.

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