INTRODUCTION

The plantar response is an important part of the neurological examination. Babinski discovered it in 1896, at least he discovered the important difference between the normal response and that in patients with diseases of the brain or spinal cord (Van Gijn 1996). His main aim was to find objective signs to distinguish hysterical from organic paralysis. Examining the plantar reflex is still a valuable routine. Sometimes it adds little to the history and the rest of the examination, for example in a patient with paraplegia, or with migraine (but in those cases at least doing it provides some extra time to think about possible gaps in the history). In other patients, a Babinski sign is an early and sometimes the only clue to an upper motor neurone lesion.

Not only neurologists test the plantar response but also internists, orthopaedic surgeons and general practitioners. It is often found among the rudiments of nervous system tests retained by non-neurologists, together with tendon jerks and pupillary responses. Stroking the sole is easy enough; the importance of the method of stimulation has been grossly overrated. But it is not so simple to determine whether the resulting toe movements are normal or abnormal, even for neurologists. Some background information is essential.

UPGOING TOES, UPGOING LEG

Why does the great toe go up with lesions of the pyramidal (corticospinal) system? First of all, the plantar reflex involves more than just the toes. This is most evident in the newborn. If one uses a fingernail to scratch the sole of a baby, not too gently (to avoid a grasp reflex), the result is re-
traction of the entire leg. This movement involves flexion of the hip and knee, and dorsiflexion of the foot and toes, especially the great toe (Fig. 1). This combined response is the so-called flexion synergy. Anatomists have attached the erroneous term ‘extensors’ to the muscles that move the toes up. After all, the leg becomes shorter if the toe ‘extensors’ contract. This is most evident in the many animals that normally walk on their toes, as opposed to the flat-footed human gait.

As the baby grows older, the pyramidal system matures and increases its influence on the spinal cord, especially on the motoneurones of distal extremity muscles. For the flexion reflex of the leg this results in two changes. The first is that the synergy as a whole becomes less brisk, at least in most people. The second is that after the first year of life the toes no longer take part in the flexion synergy. After stimulation of the solethe toes movedown, not up. The downward response is a local skin reflex, analogous to the abdominal reflexes.

If the pyramidal tract becomes damaged by disease, either structural or functional, the plantar reflex can revert to the ‘infantile’ type: the toe ‘extensors’ are again recruited into the flexion synergy of the leg. This is the sign of Babinski (Babinski 1896; Babinski 1898). But not every upgoing toe is a Babinski sign.

MYTHS

Because the plantar reflex is such a venerable sign, deeply embedded in the European neurological tradition, superstition has crept in and created a number of myths and half-truths:

• **Stimulation should be painful.** In fact sometimes even light contact such as with bedclothes is sufficient to evoke a flexion synergy of the leg (including an upgoing toe sign). Also stimulation does not have to involve the traditional ‘hockey stick manoeuvre’ starting under the lateral heel and ending up under the great toe; the question is not so much whether the toes can be encouraged to move down, but whether they move up.

• **When in doubt one can use Babinski-variants.** The plantar reflex is often the most

WHEN IS AN UPGOING TOE A BABINSKI SIGN?

Three requirements need to be met:

• **The tendon of the extensor hallucis longus muscle must be active** (Fig. 2). One should not ‘count’: upward movements of the entire foot; an upward return of the great toe after it has gone down; or an immobile great toe while the other toes go down (false impression).

• **The upward movement of the great toe should coincide with contraction of other flexor muscles in the leg** (Fig. 3). Most normal people retain at least a remnant of the flexion synergy of the leg; with unilateral lesions of the pyramidal system the leg response may be even brisker than on the normal side. As a rule, at least the tensor fasciae latae muscle can be seen to move the overlying skin. In addition the tendons of the hamstring muscles can often be seen or at least felt to contract.

• **It should be possible to elicit the phenomenon more than once.** Reactions of ticklish patients can be confusing. In those cases it is helpful to limit stimulation to a small part of the sole, preferably the lateral part of the dorsum (Fig. 2). A great toe that keeps pointing up for some time after the stimulus indicates (more or less) voluntary withdrawal.

**Figure 2** The Babinski sign. The tendon of the extensor hallucis longus muscle protrudes under the skin overlying the great toe and the dorsum of the foot. Stimulation took place at the lateral border of the dorsum rather than at the sole.
sensitive but by no means the only site on the leg from where the flexion synergy (cum Babinski sign) can be elicited. After Babinski’s discovery in 1896 more than a handful of neurologists have tried to emulate his eponymous fame by publishing a ‘new’ method of stimulation, but in fact the resulting phenomenon was always the same (Van Gijn 1996).

- Only the first movement counts. There is no reason why some other movement of the great toe might not precede the Babinski sign and the flexion synergy of the leg: a more or less voluntary movement, or an initial downward toe response (which has not necessarily disappeared altogether).

- A true Babinski sign includes fanning of the smaller toes. Babinski described this ‘signe de l’éventail’ (fan sign) in 1903 as a separate phenomenon, but he attached no great importance to it (Babinski 1903), and rightly so.

**REFERENCES**


The Babinski Sign

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