Silent neuropathy: Detection and monitoring using Semmes-Weinstein monofilaments

Aparna Santhanam
Consultant Dermatologist, Mumbai, India.

Address for correspondence: Dr. Aparna Santhanam, 7, Krithika, 14th Road, Chembur, Mumbai - 400071, India.
E-mail: aparna1271@hotmail.com

INTRODUCTION

Leprosy is one of the commonest neuropathies in the world, especially in the developing world. Leprous neuropathy affects all three components of the peripheral nervous system: the sensory, the motor and the autonomic. What is also being recognized is that leprous neuropathy begins very early in the disease process, sometimes much before the skin lesions are noticed.[1]

Most of us are familiar with the neuritis that accompanies nerve involvement in leprosy. However, there is a process of nerve involvement that begins much before the patient becomes symptomatic. This stage of asymptomatic nerve involvement is called silent neuropathy.[2]

DEFINITION OF SILENT NEUROPATHY

Silent neuropathy is a clinical term used for neuropathy with motor and/or sensory impairment, but without complaints of nerve pain, paresthesia or nerve tenderness on palpation. It does not refer to the chronic insidious destructive neuropathy of lepromatous leprosy, but rather to the episodes of neuropathy that cause clinical nerve damage within a relatively short period (weeks to months).[3]

DETECTION OF SILENT NEUROPATHY

Detection and monitoring for silent neuropathy is very important as early intervention can aid in limiting nerve damage and ultimately prevent disability. However, conventional testing methods such as temperature testing with hot and cold test tubes, touch and pressure sensation testing with a ball point pen or pinprick are crude and inadequate to detect this condition. An ideal test for neuropathy should be sensitive (so as to detect all cases of neuropathy), specific (so as not to detect those without neuropathy), accurate (it should reflect severity closely), reproducible and repeatable.[4]

Indentation of the skin is believed to be the most quantifiable way of measuring the perception of touch. Either the application force or the skin displacement can be measured.[5] While there are many electronic devices that allow monitoring of this application, like the vibrameter and electronic pressure specifying sensory device, none of them are viable options in the field. Comparative scientific tests have shown that Semmes-Weinstein (SW) monofilaments provide an attractive alternative and yet give quantifiable results.[6]

SENSORY TESTING USING NYLON MONOFILAMENTS

A nylon monofilament was first used for sensory testing in 1969 in Nigeria to differentiate various forms of leprosy.[7] The original kit of SW monofilaments consisted of 20 monofilaments, but a set of five "pocket' monofilaments is easier to use and has greater repeatability (Table 1).[8]

WHO SHOULD BE TESTED?

Ideally all patients diagnosed as having leprosy should

be tested. However, if time or resources are a constraint, then the following patients should definitely be tested: patients with borderline leprosy, irregular compliance,[9] more than ten skin lesions, more than three thickened nerves, or those who are BI-positive.[6]

THE FILAMENTS AND HOW TO USE THEM

The filaments are made from polyhexamethylene dodecandiamide, better known as nylon 612, which absorbs very little water (less than 3% in 100% humidity) and can be cleaned by alcohol. It has an indefinite shelf life.[10]

Each filament is mounted on holders such as bicycle wires or needle bottoms and has a length of 38 mm (Figure 1). It should be applied perpendicularly to each specified site on the hands (3 sites for the ulnar and median nerves each, and 1 site for the radial nerve) and feet (7 sites on the soles for the posterior tibial nerve, and 1 site on the dorsum of the foot and two sites on the shin for the lateral popliteal nerve) to form a C-shaped curve (Figure 2). Application is started with the finest (the green) filament and built up to the orange one. The details of the score should be recorded on a hand and foot screen form for each nerve (Figures 3 & 4). Testing should be done once in 15 days for the first

Table 1: Semmes-Weinstein filaments

Color	Force (g)	Score	Interpretation
Green	0.05	5	Normal
Blue	0.20	4	Residual texture
Purple	2.00	3	Residual protective sensation
Red	4.00	2	Loss of protective sensation
Orange	7.50	1	Residual deep pressure

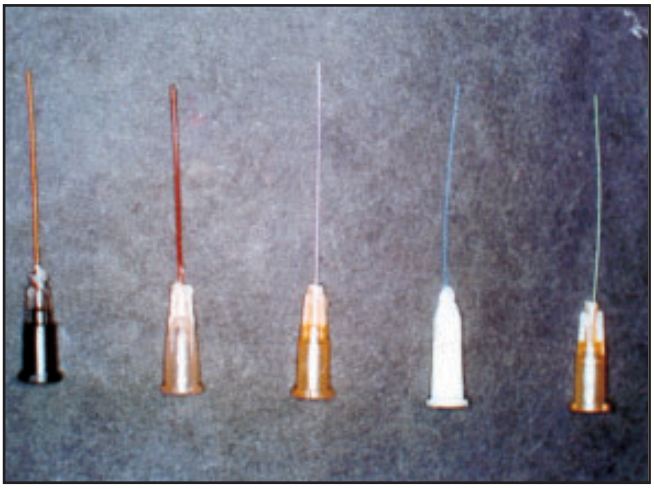

Figure 1: Semmes-Weinstein monofilaments

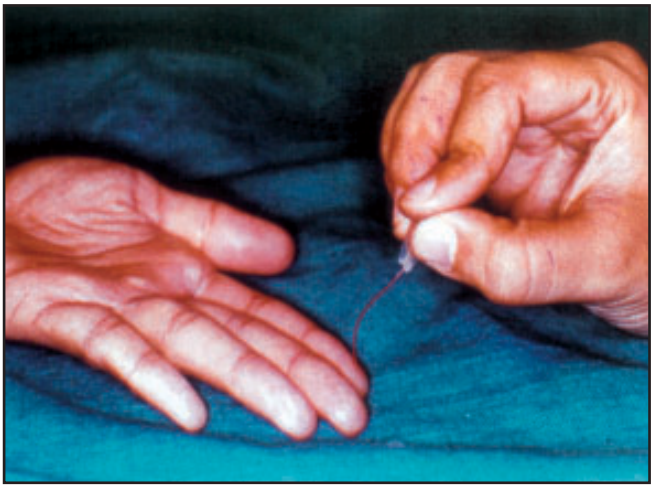

Figure 2: C-shaped curve during testing ensures application of correct pressure

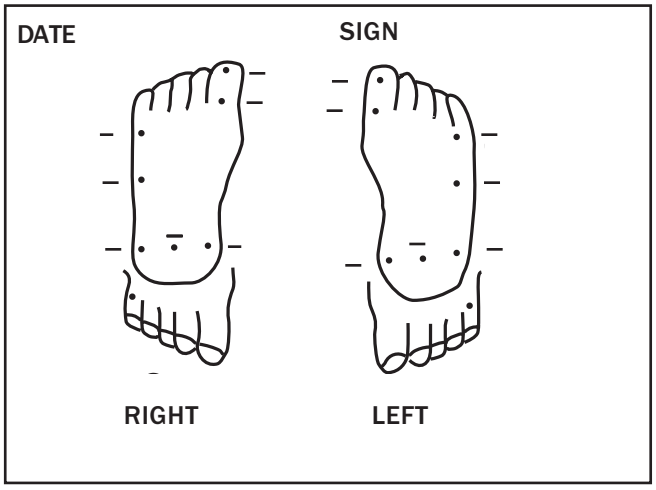

Figure 3: Foot chart for recording sensory testing

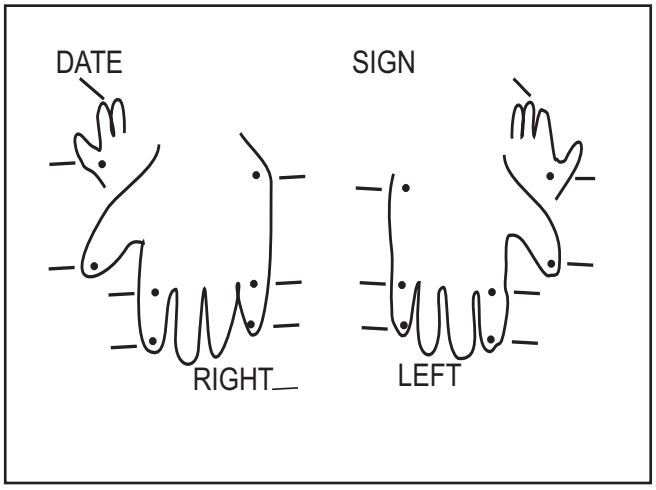

Figure 4: Hand chart for recording sensory testing

4 months and subsequently once a month.[10]

INTERPRETATION

Any patient not feeling the purple or 2 g monofilament is designated as suffering from silent neuropathy.[6,11] Simultaneous voluntary muscle testing (VMT) is done. Any patient whose SW or VMT score drops by 2 or a combination of both drops by 2 is also designated as developing silent neuropathy. However, if the patient becomes symptomatic, then the neuropathy is no longer silent.[11]

COURSE OF ACTION

Any patient with silent neuropathy must be treated with oral steroids to reduce impairment, prevent reversal reaction and hence prevent disabilities.[6,12]

CONCLUSION

Silent neuropathy is a well defined entity that can be accurately detected with the help of Semmes-Weinstein monofilaments. Early detection and treatment with steroids limits impairment and reduces reversal reactions and eventual disabilities.

REFERENCES

1. Dastur DK. Pathology and pathogenesis of predilective sites of nerve damage in leprous neuritis. Neurosurg Rev 1983;6:139-52.
2. Hamilton J. Deformity prevention in the field – A systematic approach. Lepr Rev 1983;54:229-37
3. Srinivasan H, Rao KS. Steroid therapy in quiet nerve paralysis in leprosy. Ind J Lepr 1982;54:412-9.
4. Dyck PJ. Quantitating severity of neuropathy. In: Dyck P, Thomas P, Griffin JW, Low PA, Podusio JF, editors. Peripheral neuropathy. 3rd ed. Philadelphia: WB Saunders; 1992. p. 686-97.
5. Bell Krotoski JA. A study of peripheral nerve involvement underlying physical disability of the hand in Hansen's disease. J Hand Ther 1992;3:133-42.
6. Van Brakel WH. Peripheral neuropathy in leprosy. The continuing challenge [Thesis]. University of Utrecht, The Netherlands; 1994.
7. Jamison DG. Sensitivity testing as a means of differentiating the various forms of leprosy found in Nigeria. Lepr Rev 1969;40;17-20.
8. Krotoski-Bell JA, Tomancik JA. The repeatability of testing with Semmes-Weinstein monofilaments. J Hand Surgery 1987;12:155-61.
9. Hammond CJ, Klenerman P. Protective sensation in the foot in leprosy. Lepr Rev 1988;59:347-54.
10. Bell Krotoski JA. Pocket filaments and specifications for Semmes-Weinstein monofilaments. J Hand Ther 1993;3:26-9.
11. Weinstein S. Somatosensory research- Fifty years. J Hand Ther 1993;6:11-22.
12. Palande DD, Bowden RE. Early detection of damage to nerves in leprosy. Lepr Rev 1992;63:60-72.