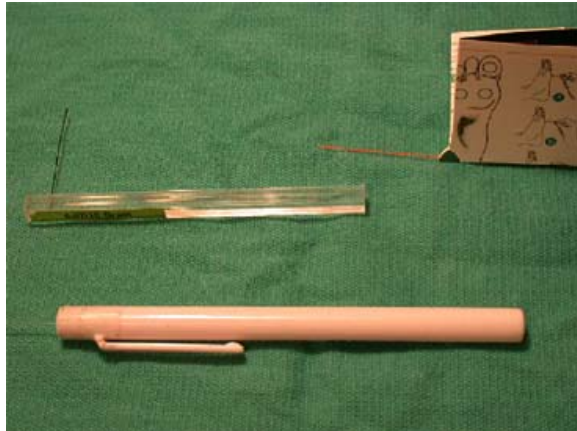


Using the 10-g Semmes–Weinstein Monofilament

The Semmes–Weinstein 5.07 monofilament exerts 10 grams of force when bowed into a C-shape against the skin for one second. Patients who cannot reliably detect application of the 10-g monofilament to designated sites on the plantar surface of their feet are considered to have lost protective sensation. That is to say, these patients cannot reliably feel discomfort on their feet and take appropriate avoidance action to prevent tissue damage. This loss of protective sensation is not equivalent to the total absence of sensation.

Patients with diabetes who have lost protective sensation as measured by standardized testing with the 10-g monofilament are at significantly increased risk to develop a foot ulcer that can lead to subsequent lower extremity amputation. Patients who have lost protective sensation are candidates for regular podiatric care, intensive foot care education, visual inspection of the feet at every office visit, and in some cases, therapeutic footwear.



Testing for quantitative vibration perception threshold with an instrument called the biothesiometer is another excellent test for protective sensation, but the equipment is seldom available in primary care settings. Some clinicians believe that testing vibration sensation with the 128-Hz tuning fork



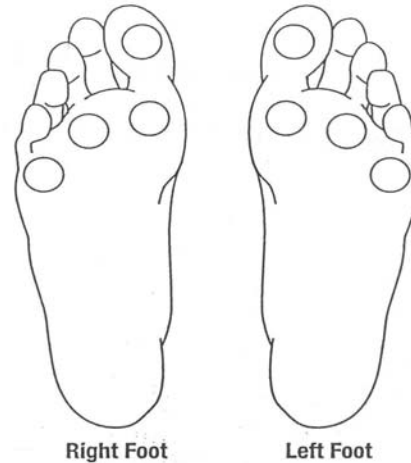
over the hallux of each foot may detect loss of protective sensation equally well as compared to 10-g monofilament testing at four plantar sites on each foot. Although this has not been proven by an adequately powered prospective study, the 2006 “Clinical Practice Recommendations” of the American Diabetes Association propose that the use of both 10-g monofilament testing and vibration sense testing at the hallux may increase diagnostic ability to detect the loss of protective sensation. Suggested techniques for 10-g monofilament testing and vibration sense testing with the 128-Hz tuning fork are detailed below.

Suggested Technique for Using the 10-g Monofilament:

1. Obtain two or more reusable monofilaments or a packet of disposable monofilaments (MFs) from one of the sites listed under “Resources For 10-g Monofilaments.”
 - a. Use the 10-g MF < 100 applications/day, then “rest” it for 24h – thus the need for at least 2 MFs.
 - b. The accuracy of 10-g MFs obtained as samples from pharmaceutical companies is unknown.
2. Check the 10-g MF for defects. Replace if bowed, kinked, or twisted.

3. Compress the 10-g MF twice before use each day.
4. Place the patient in the supine position for ease of testing.
5. Tell the patient that you are testing for loss of protective sensation that increases the risk for foot ulcer and amputation.
6. Demonstrate buckling of the 10-g MF on the patient's forearm or hand.
7. Have the patient close their eyes.
8. Test four sites (See diagram) on each foot in random sequence. Avoid scars, calluses, and ulcers.

- a. Test the plantar surface of each great toe.
- b. Test the plantar surfaces of the 1st, 3rd, and 5th metatarsal heads of each foot.
 - If callus, scar, or ulcer is present, test at adjacent sites on the plantar surface of the foot.



9. Hold the 10-g MF perpendicular to the test site, and then bow it to a C-shape for one second.
 - a. Do not allow the 10-g MF to slide along the skin.
 - b. The patient should sense the 10-g MF by the time that it bows.
10. Grade the patient's response by using the approach suggested by the International Consensus Group on the Diabetic Foot:
 - a. Bow the 10-g MF at a designated site, and ask the patient, "Do you feel it touch you – yes or no?"
 - b. Repeat testing twice at each site and randomly include a "sham" application in which the 10-g MF is not applied. There will be a total of three applications at each site, one of which does not touch the skin.
 - c. Protective sensation is considered to be present if the patient correctly answers two or more of the three applications, one of which was a sham.
 - d. If the patient correctly answers only one or none of the three applications, return and retest that site.
 - e. The patient is considered to have insensate feet if they fail on retesting at just one or more sites on either foot.
11. Caveats:
 - a. The feet may be falsely insensate when cold or edematous.
 - b. Heel testing does not discriminate ulcer formers.
 - c. Patients who have normal protective sensation should be retested annually.
 - d. Technically, patients who have insensate feet need not be retested. Some clinicians believe that repeated testing of the individual with insensate feet may be a useful educational and motivational tool.

Suggested Technique for Using the 128-Hz Tuning Fork:

1. Use only the 128-Hz tuning fork (TF).
2. Demonstrate the sensation of vibration and its differentiation from pressure by applying the TF either to the wrist or elbow during and after stopping vibration.
3. Ask the patient to close their eyes.
4. Test the dorsum of each hallux (first or great toe) just proximal to the nail bed. Place the index finger of the other hand beneath the patient's toe to feel the vibration and determine the accuracy of the patient's response. Apply the TF perpendicularly with a constant pressure.
5. Use an initial sham test on each foot by applying a non-vibrating TF to be sure the patient does not mistake the sensation of pressure for vibration: "Is the tuning fork vibrating?" The patient should answer, "No."
6. Use the "on-off" method to score the patient's response:
 - a. Conduct testing twice on each great toe.
 - b. On each test:
 - Ask the patient to identify the beginning of the vibration sensation: "Is the tuning fork vibrating?"
 - Ask the patient to identify the cessation of vibration on dampening the TF: "Tell me when the vibration stops." Dampen the TF at random times without the patient's knowledge.
 - c. The number of correct responses may vary from 0 to 8: vibration and cessation of vibration, each performed twice on each hallux.
 - d. At least five incorrect responses rules in a diagnosis of peripheral neuropathy.