

## Letter to the Editor

### Evaluation of a skin test device designed to be less painful

*To the Editor:*

In 1965, Melzack and Wall<sup>1</sup> proposed the “gate control theory of pain.” The basic proposition of this theory is that signals from the periphery that are perceived in the brain as pain can be modulated and suppressed in the spinal cord by central influences, such as attention and emotions, and by peripheral input through large, rapidly conducting nerve fibers termed A-beta. Among the stimuli that activate these pain-suppressing nerve fibers, the authors listed vibration, scratching, and application of gentle pressure to the skin.

The gate control theory of pain is now widely accepted.<sup>2</sup> It probably explains the effectiveness of many forms of home remedies, such as massage and application of heat and cold, as well as providing the theoretic basis for treatments such as acupuncture and transcutaneous electrical nerve stimulation.<sup>3</sup>

A commercially available skin test device, the MultiTest (Lincoln Diagnostics, Decatur, Ill), has been modified to apply light pressure before the tines penetrate the skin, with the intent to reduce the pain produced by penetration of the tines (Fig 1). The proprietary name for this modified device is the MultiTest PC, with “PC” being short for pain control.

This letter reports a comparison of the performance and discomfort associated with use of this new device compared with another multiheaded skin test device that is designed for more comfortable skin testing, the ComforTen (HollisterStier, Spokane, Wash).

Twenty adults participated in a partially blinded parallel study approved by the Institutional Review Board of National Jewish Health. All participants signed a consent form before participation. Subjects ingested no antihistamines within a week, and antidepressant use was an exclusion.

Subjects were tested with the 2 devices, one of each on the volar surface of each forearm and one of each on either side of the

upper back. One study coordinator loaded devices; for the forearm, half the heads were loaded with 1% histamine base and half with saline, whereas for the back, half of the heads were loaded with 6% histamine base and half with saline. A second study coordinator, who had received training from each company in the proper use of their device, performed application of the devices. After 15 minutes, the first coordinator outlined all wheals with ink and transferred the results to the case report forms. The mean diameter of the wheals was measured and analyzed (Table I). Subjects were asked to rate the degree of discomfort for each device and location on a scale of 0 (none) to 10 (intense, Table I) and to express a preference, if they had one, for one or the other device. There were no wheals with either device at either location with saline. There was no significant difference in subject preference for the 2 devices.

Normally, in skin testing discomfort correlates with the degree of trauma, which in turn correlates with the size of the resulting wheal. In this study the size of the wheal with the MultiTest PC was significantly larger than that with the ComforTen. This more robust response to histamine was reflected in significantly fewer wheals that did not meet the conventional 3-mm criterion for a positive reaction.<sup>4</sup> On the other hand, the MultiTest PC showed no tendency to cause greater discomfort. This suggests that the preceding touching of the skin had diminished the perception of pain. This finding is consistent with reports of preceding pressure at the site decreasing the pain of intramuscular injections of immune globulin,<sup>5</sup> massaging the leg reducing the pain of a heel stick in babies,<sup>6</sup> and a pneumatic skin-flattening device reducing pain associated with laser removal of tattoos.<sup>7</sup>

In summary, we compared a new skin test device designed to apply light pressure to the skin before puncturing and another device designed for causing little discomfort with skin testing. The new device is based on the gate control theory of pain, which proposes that light pressure will activate nerve fibers that reduce or block the sensation of pain. We found that the device using the

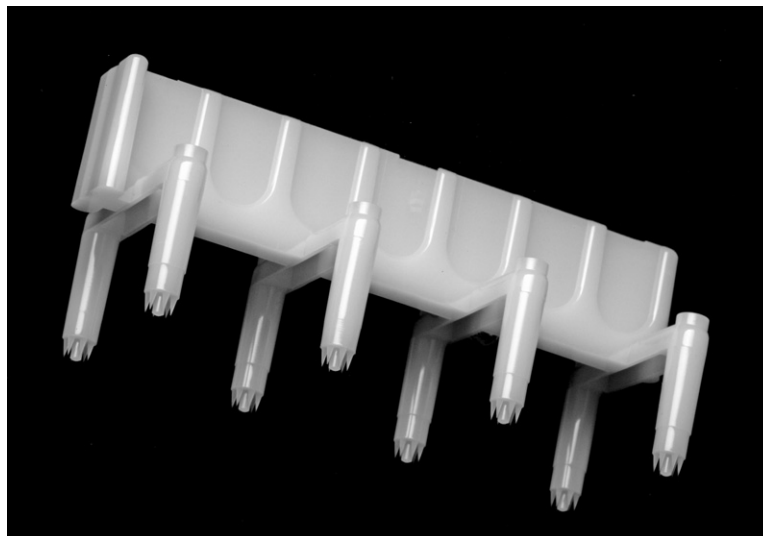


**FIG 1.** View of the MultiTest PC showing the pressure site in the middle of each cluster of tines.

**TABLE I.** Performance and discomfort with the 2 devices

| Parameter           | ComforTen   | MultiTest   |                | P value |
|---------------------|-------------|-------------|----------------|---------|
|                     |             | PC          | Difference     |         |
| Histamine, arm      |             |             |                |         |
| Wheal diameter (mm) | 4.00 (1.19) | 6.25 (1.03) | 2.25 (1.9-2.6) | <.001*  |
| No. of wheals <3 mm | 18          | 3           |                | .004†   |
| Discomfort (0-10)   | 2.5         | 2.3         | 0.2            | .58‡    |
| Histamine, back     |             |             |                |         |
| Wheal diameter (mm) | 5.02 (1.53) | 7.15 (1.53) | 2.13 (1.8-2.4) | <.001*  |
| No. of wheals <3 mm | 9           | 0           |                | .005†   |
| Discomfort (0-10)   | 2.15        | 1.8         | 0.35           | .58‡    |

Statistical analyses were done with R software (<http://www.R-project.org>).

\*Paired *t* test.

†Fisher exact test.

‡Sign test.

gate control approach produced significantly larger and more consistently positive skin test responses with histamine than the conventional skin test device, yet the sensation of discomfort was not significantly different between the 2 devices. This suggests that the new device did elicit inhibitory nerve activation, as proposed.

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