Cotton-tipped applicator test: validity and reliability in chronic pelvic pain

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OBJECTIVE: We sought to assess the concurrent validity and interrater reliability of the cotton-tipped applicator (CTA) test as a screening tool for diagnosis of cutaneous allodynia in patients with viscerally related chronic pelvic pain (CPP).

STUDY DESIGN: We performed a prospective cohort comparative observational study of referred patients to a gynecology clinic with CPP. A total of 22 females with CPP were compared to 23 pain-free controls and 12 cyclic pain patients. Participants were evaluated by 2 clinicians. The CTA test was performed to detect the appearance of pain in dermatomes of T10-L1.

RESULTS: Interrater reliability resulted in 98% agreement for the 3 study groups. CTA test showed 73% sensitivity and 100% specificity for differentiating patients with CPP from pain-free patients.

CONCLUSION: The CTA test had excellent interrater reliability and concurrent validity for diagnosis of cutaneous allodynia in CPP patients with visceral diseases versus controls.

BACKGROUND AND OBJECTIVE
Chronic pelvic pain (CPP) causes disability and distress, compromises quality of life, and affects health care costs. CPP is a multicausal disease. While a multidisciplinary approach to management often proves effective, it fails to explain why some women continue to experience daily pain that is insensitive to large doses of pain medication. The concept of central sensitization may help to explain this medical problem.

The concept of neuroplasticity explains the changes in the function of the central nervous system. The stimuli for the changes are multifactorial. Severe or prolonged visceral pain from pelvic organs appears to be a significant contributing factor. Visceral pain may be referred to dermatomes that correspond to the affected somatic nerve fibers. In addition, both peripheral somatic and visceral nerves often synapse in the spinal cord at the same dorsal horn neurons.

If noxious stimuli such as inflammatory processes following endometriosis or pelvic inflammatory diseases continue for a prolonged time, neurons within the spinal cord display increased excitability (central sensitization). The creation of pain from an innocuous stimulus in the related cutaneous areas is cutaneous allodynia.

Current methods for identifying patients with pain hypersensitivity are sufficiently complex to limit their application in clinical settings. The cotton-tipped applicator (CTA) test has been introduced to identify this group of patients. In an exploratory evaluation of 3 bedside tests, the CTA test for cutaneous allodynia appeared to have the greatest likelihood of predicting preexisting or ongoing visceral disease.

The aim of the present study was to assess the reliability and validity of this test as a screening method by testing the presence of cutaneous allodynia among women with vs without CPP. We hypothesized that this test was reliable, feasible, and valid for assessing cutaneous allodynia.

MATERIALS AND METHODS
In a prospective cohort comparative observational trial, subjects were recruited...
from referred patients to Calgary Chronic Pain Clinic and Foothills Medical Center in 2010 through 2011. The presence of pelvic visceral disease (eg, endometriosis and adenomyosis) as a possible cause of CPP was determined based on a documented operative record from regional health records.

Participants’ demographic information and medical history were reviewed. Subjects were allocated to 3 groups: 22 women with chronic continuous pelvic pain, 12 with cyclic pelvic pain, and 23 with no pelvic pain. Two clinicians performed the CTA test to determine the presence or absence of CA.

The primary outcome was measured based on a dichotomous “yes/no” response. Concurrent validity assessment was based on observing the rates of cutaneous allodynia among patients with continuous pain due to pelvic visceral disease and those with no pain. Interrater reliability was measured based on the raters’ agreement on the presence or absence of cutaneous allodynia in each group. Interrater reliability was measured via the proportion of agreement and McNemar test.

**RESULTS**

Participants’ mean age, gravidity, and parity were similar in the 3 study groups. The median duration of pain was comparable in the continuous group and the cyclic pain group (6 vs 5 years). Patients in the continuous pain group had higher baseline pain intensity, all >5 on a visual analog scale of 0–10.

The CTA test reached excellent discrimination of continuous CPP cases from cyclic CPP cases (P < .001), providing further evidence for concurrent validity. The CTA test showed 98% (95% confidence interval, 0.91–1.00) agreement between 2 raters with the McNemar test P value of .317.

**COMMENT**

Unfortunately, many CPP patients interpret a physician’s report of a normal test result as a statement that their anatomy is normal and their pain must be in their mind. We used the CTA test as a screening method in patients with chronic pain to validate their concerns and possibly avoid the expense and discomfort of repeated evaluations. We noted that patients with a history of preexisting or concurrent visceral disease showed a higher rate of cutaneous allodynia. The value of the test when positive would appear to indicate the presence of current or previous visceral disease.

In the current study, 4 women with a hysterectomy and bilateral salpingo-oophorectomy for previous visceral disease had a negative test despite having a chronic pain state. Another woman in the continuous pain group had complete suppression of her menstruation for the last 3 years. This may indicate that the treatment of endometriosis with the induction of amenorrhea may be the first step in reversing the effects of neuroplasticity and helping these patients to combat the process of a chronic pain state.

Strengths of the study include consistency with our understanding of central sensitization and previous studies of cutaneous allodynia as well as the significant findings related to validity and reliability.

Further studies of this simple test in the clinical environment appear warranted.

In summary, this study showed that the CTA test has excellent concurrent validity, with significant specificity and sensitivity and excellent interrater reliability in the detection of central sensitization and cutaneous allodynia in patients with continuous pain due to visceral disease.

**CLINICAL IMPLICATIONS**

- The cotton-tipped applicator test is a valid and reliable approach to measure central sensitization and cutaneous allodynia in patients with visceral chronic pelvic pain.
- Using such a tool might help to distinguish patients in a chronic pain state from those with acute problems.
- Early and effective treatment of patients with signs of endometriosis may be the first step in reversing the effects of neuroplasticity and helping these patients to combat the process of chronic pain state.
- Treating endometriosis by inducing amenorrhea may prevent progression of chronic pain state and central sensitization.