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Tuning Fork Testing in Sudden Sensorineural Hearing Loss

Sudden sensorineural hearing loss (SNHL) is a condition for which prompt diagnosis and initiation of treatment is of paramount importance.¹ Because patients frequently seek initial evaluation in urgent care or primary care settings, audiologic assessment may not be immediately available. As such, tuning forks have the potential to assist with initial treatment and appropriate triage because they are available, inexpensive, and easy to use. However, the role of tuning fork testing in the initial workup of hearing complaints has not been clearly elucidated.^{2,3}

A recent multicenter, randomized controlled clinical trial compared oral and intratympanic corticosteroids for sudden SNHL.⁴ Tuning fork testing and formal audiometry were performed as part of the baseline assessment of eligible study participants, creating a robust database that facilitates a prospective evaluation of the utility of the Weber test in this setting. We hypothesized that the Weber test would be a useful clinical metric to diagnose unilateral SNHL.

Methods. Study Design. This study uses data that determined whether patients were eligible to participate in a prospective multicenter, randomized, clinical trial that

compared different treatments for sudden unilateral SNHL (clinicaltrials.gov NCT00097448).⁴ The trial was conducted from 2004 through 2009 and was approved by the institutional review boards of all participating sites.

Participant Recruitment. Adult patients who presented with unilateral idiopathic sudden SNHL were included. Audiometric criteria for inclusion were a documented pure tone average (PTA) of at least 50 dB in the affected ear, and at least a 30-dB difference between ears in at least 1 of the 4 PTA frequencies.

Hearing Evaluation. The Weber test was administered with a 512-Hz tuning fork at screening or enrollment. To perform the Weber test, 1 tine of the tuning fork was struck forcefully enough for the examiner to perceive sound. The fork was placed firmly on the scalp vertex, forehead, or maxillary dentition. The patient reported whether sound was perceived better in either ear or heard in the midline.⁵ Audiometric evaluation was performed thereafter; variables for each ear included frequency thresholds and PTA.

Statistical Analysis. The results of the Weber test at the time of study enrollment were compared with the results of the audiogram. The sensitivity of the Weber test was calculated. κ Coefficients were calculated to quantify the magnitude of agreement between the Weber test and the PTA. McNemar test was used to test whether the identification of the affected ear by the Weber test was concordant with the PTA results. These analyses were performed for the entire data set (n=250), as well as for the subset of patients for whom the Weber test lateralized (n=198).

Results. The Weber test correctly lateralized to the ear opposite the hearing loss in 196 of patients (78%). Of the remaining 22%, 2 cases (1%) incorrectly lateralized, falsely indicating conductive loss; 38 (15%) were heard in the midline, and 14 (6%) were not heard. Despite good overall agreement between the audiogram results and the Weber test with low discordance, the Weber test did not reliably predict the audiogram results for the entire cohort. Among the subset of patients for whom the Weber test lateralized (n=198), the Weber test correlated considerably better, and was a reliable predictor of the audiogram results (**Table**).

Comment. Since most patients who experience a sudden SNHL are seen in a primary care setting, and since more common conditions are often difficult to distinguish based on clinical assessment alone, referral for specialty evaluation and audiometry are frequently delayed beyond the ideal therapeutic window.⁶ This study was undertaken to evaluate whether the Weber test might help identify patients with suspected SNHL who require prompt referral and treatment. The finding that the Weber test did not lateralize or could not be heard in over 20% of study participants was consistent with other reports that conclude that Weber test results can be unreliable.^{2,3}

The high reliability of the Weber test when it lateralized away from the suspect ear confirms that the test retains value in the clinical setting when assessing a patient presenting with acute hearing complaints. Most patients with alternative diagnoses routinely considered by primary care providers, such as cerumen impaction, Eustachian tube dysfunction, or otitis media, will present with a conductive hearing loss. Thus, if a Weber

Table. Comparison of Weber Test to Audiogram in Sudden Sensorineural Hearing Loss

Parameter	All Patients (n = 250)	Subset for Whom Weber Test Lateralized (n = 198)
Sensitivity, %	78	99
Overall agreement ^a	0.82	0.98
P value ^b	.19	.50
AUC ^b		
500 Hz	0.56	0.80
P value	.09	<.001
PTA ^b	0.56	0.88
P value	.09	<.001

Abbreviations: AUC, area under curve; PTA, pure tone average (the arithmetic mean of the hearing thresholds at 500, 1000, 2000, and 4000 Hz).

^a κ Coefficient.

^bP value calculated by McNemar test.

test unexpectedly lateralizes to the asymptomatic, better hearing ear, this finding should prompt immediate audiometric testing, and urgent otologic referral if a sensorineural loss is confirmed.⁷

In light of these data, clinicians should be alert to the possibility of sudden SNHL being overlooked in patients without the expected tuning fork findings. However, among patients presenting with sudden unilateral hearing loss, lateralization of the Weber test to the contralateral ear very reliably predicts a sensorineural etiology, and such patients should be promptly referred and treated accordingly.

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Change in Intern Calls at Night After a Work Hour Restriction Process Change

To accommodate shorter intern shifts (16 hours) required by the Accreditation Council for Graduate Medical Education (ACGME), a night-float cross-coverage system was put into place at Harbor–University of California, Los Angeles, Medical Center (HUMC) in July of 2011. We conducted prospective surveys to evaluate the nature and frequency of the calls received by night-float residents.

Methods. At HUMC, 5 ward teams, each composed of 2 residents and 3 interns, admit patients to the hospital, with 1 team on call each night. Before the new work hour rules, the overnight on-call interns (3 per night) provided cross-coverage for the other 12 interns who were not on-call. After the change, 1 second-year night-float resident cross-covered for all 12 interns who were not on-call, from 5 PM to 7 AM. We deployed a written survey instrument, on which all calls received by the night-float resident were documented in real-time. This study was deemed as category-2 exempt under 45 CFR 46.101(b) by the John F. Wolff institutional review board at the Los Angeles Biomedical Research Institute.

Results. Data were available from 16 of the 17 evenings during the first survey period (survey response rate, 94%), totaling 547 calls, with a median of 35 (range, 18-57) calls per 14-hour period. The median time between the calls was 11 (range, 5-25) minutes. A total of 128 calls (23%) related to issues that had been signed out by the primary team. By far the most common reason for calls was “provider confusion” (ie, calls for patients for whom a night-float resident was not responsible; **Table**). The next 2 most common causes of calls (minor patient complaints and order clarifications) also could not have been altered by changes to the sign-out process.

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After the first survey, we implemented a new page forwarding system, so that residents leaving the hospital electronically forwarded their pages to the night-float resident. We also altered procedures related to renewing restraints, so health care providers would no longer get called in the middle of the night to renew automatically expiring orders. As a result, during the second period (surveys were completed on 10 of the 14 nights), a signifi-