# Laboratory Evaluation of Vocal Fold Paralysis and Paresis

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**Summary: Objectives.** This study aimed to assess the value of comprehensive laboratory evaluation in patients with vocal fold paralysis or paresis.

**Study Design.** This is a retrospective chart review.

**Methods.** Records of 231 patients with vocal fold paralysis or paresis were reviewed to determine whether there is a significant increase in the number of abnormal test results compared with rates of abnormal results for these tests in the general population and whether testing resulted in clinically important diagnosis. Laboratory data were collected from charts from initial visits from 2010 to 2014 and compared with national data.

**Results.** When controlled for age and sex, white blood cell count was found to have a significantly higher rate of abnormal test results ($P < 0.001$) in patients with vocal fold paralysis or paresis than the general population. Although hemoglobin, thyroid-stimulating hormone, and thyroid antibody tests were more likely to be abnormal in our patient population, the trend was not statistically significant. Further, the prevalence of syphilis and myasthenia gravis was found to be higher in these subjects than their respective national prevalences, and the incidence of Lyme disease was found to be higher than the national prevalence of Lyme disease. Several patients were diagnosed with medically important conditions such as diabetes, thyroid dysfunction, syphilis, myasthenia gravis, and Lyme disease based on these tests.

**Conclusion.** This study suggests that comprehensive testing of patients with vocal fold movement disorders results in diagnoses that would be missed without a comprehensive evaluation, some of which are important medically, although their causal relationship to vocal fold paralysis or paresis was not investigated or established.

**Key Words:** Vocal fold paralysis–Vocal fold paresis–Dysphonia–Laboratory tests–Blood tests–Work-up for dysphonia–Hoarseness.

## BACKGROUND

Vocal fold paralysis or paresis can have a substantial impact on a patient's life, impacting voice, swallowing, and airway function. To manage the condition properly, it is crucial to determine its cause. The most common causes reported are nonlaryngeal malignancies, iatrogenic injuries, and idiopathic causes.[1] Neoplasms and postsurgical causes underlie paralysis more often than purely idiopathic causes.[2] A careful history and examination may help identify the etiology in many patients. However, because of the potentially important and treatable causative disorders underlying vocal fold paralysis and paresis, additional tools and tests are often used to determine etiology.

Diagnostic testing frequently includes laryngeal electromyography, imaging studies, and laboratory tests.[3] Considerable variability exists in clinical practice regarding the use of laboratory tests. Serum testing has traditionally been accepted as a standard screening tool in patients with vocal fold paralysis with no apparent cause.[3] However, there is a lack of evidence-based medicine to support the effectiveness of serum testing in vocal fold paralysis or paresis. Most of the studies evaluating serum testing are either case reports or small case series that do not provide any conclusive support for routine serum testing.[4]

Despite the lack of any definitive studies showing the need for blood tests, a survey of the American Broncho-Esophagological Association showed that serum testing is used widely. For unilateral vocal fold paralysis with no apparent cause, 70% of respondents said serum testing was at least "occasionally necessary," with 20% opining that it was "always" or "often" necessary.[4] When asked which laboratory tests are usually ordered in this evaluation, respondents' common responses included rheumatoid factor (RF), Lyme titer, erythrocyte sedimentation rate, antinuclear antibody (ANA), complete blood count (CBC), venereal disease research laboratory (VDRL) assay, and chemistry panel (including fasting blood glucose [BG]).[4] A later survey of American Broncho-Esophagological Association physicians showed that when evaluating idiopathic vocal fold impairment, serum testing is ordered in 71% of cases involving adults and in 51% of cases involving children.[5]

Our clinical experience leads us to believe that laboratory testing is warranted in patients presenting with vocal fold paresis or paralysis. We perform extensive testing routinely on all patients with vocal fold motion abnormalities. Given the lack of definitive support in the literature and the varying practices among laryngologists, we performed a retrospective study to determine the prevalence of positive laboratory testing in patients presenting with vocal fold paresis or paralysis.

## METHODS

A retrospective chart review of 231 subjects was performed using office charts from the senior author's (R.T.S.) practice to collect

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data on patients with a diagnosis of vocal fold paralysis or paresis between 2010 and 2014. Inclusion criteria included the following: (1) presenting complaint of dysphonia, (2) *International Statistical Classification of Diseases and Related Health Problems: ICD-9* codes for vocal fold partial or complete paralysis, and (3) diagnosis confirmed by abnormal laryngeal electromyography. Adults with a normal or absent electromyography and children were excluded from the study. Each patient's chart was reviewed, and relevant information was collected, including age, sex, chief complaint, medical history, surgical history, laryngeal electromyography results, and strobovideolaryngoscopy findings. Results for various laboratory tests were also collected, including Lyme titer, erythrocyte sedimentation rate, fasting BG, thyroid-stimulating hormone (TSH), ANA, RF, fluorescent treponemal antibody absorption (FTA-ABS), antithyroid peroxidase antibody, antithyroglobulin antibody, white blood cell (WBC) count, and hemoglobin (Hg). Abnormal thyroid examinations and results of history and images performed at the time of diagnosis of vocal fold paralysis or paresis, along with results of further work-up, were documented. Patient charts lacking the required information were excluded.

In addition to recording the absolute value for the laboratory test, the test result was marked as either normal or abnormal, depending on the report and reference values from the laboratories. For fasting BG, the values were considered abnormal if they were >125 to allow for comparison with prevalence of diabetes. The percentage of abnormal results for a particular test in the patient population was then compared with the prevalence (or incidence when prevalence data were not available) of abnormal results for that test based on national population statistics. National data also were broken down by gender and age when this information was available. The national data were used as a control population to compare with our sample patient population.

To characterize the patients presenting with vocal fold paralysis, we noted whether laboratory testing provided patients with new diagnoses. The prevalence of patients in this population with new diagnoses, such as diabetes, thyroid dysfunction, syphilis, Lyme disease, myasthenia gravis, positive ANA, and rheumatoid arthritis, was compared with that diagnosed disease's incidence or prevalence in a similar population. National data were used again. However, sex and age data were not available for all of these analyses.

After data collection, the information was analyzed using *SPSS Statistics* (IBM SPSS Statistics for Macintosh, Version 22.0. Armonk, NY: IBM Corp.). The percentage of abnormal test results in our patient population was compared with the percentage of abnormal results for the test in the general population after adjusting for age and sex, when available. Standard statistical analysis was used, including z-score and exact binomial test.

## RESULTS

Data were collected from 231 patient charts. Patient demographics are summarized in Table 1. The average age of the patients was 50.9 (+/– 16.0) years. Eighty-three (35.9%) were men and 148 (64.1%) were women. The number of abnormal results for each laboratory test is listed in Table 2. The prevalence or incidence rates for abnormal results in the national data were broken down by age and sex to adjust for the differences in our population from the general population. Unfortunately, age and sex data were not available for every indicator in this analysis, including antithyroglobulin antibody, Lyme disease, laryngeal myasthenia gravis, RF, and syphilis. Of the test results collected, comparable national population rates with age and sex data were available for WBC, TSH, antithyroid peroxidase antibody, ANA, Hg, and fasting BG.[6–8] For each test, the groups were compared, and the results are summarized in Tables 2 and 3.

**TABLE 1.**
**Demographic Data for the Study Population (n = 231)**

| Characteristic | Value |
|---|---|
| Mean age in years (+/– SD) | 50.9 (+/–16.0) |
| Male—n (%) | 83 (35.9%) |
| Female—n (%) | 148 (64.1%) |

A total of 111 patients had information for WBC count. Sixteen (14.4%) patients had abnormal results, either high (leukocytosis) or low (leukopenia). Standard reference ranges for WBC are set based on the assumption that 5% of the population will have WBC in the abnormal range. As a result, 5% was used as the control value. The absolute difference between the two was 9.4%. Thus, the increased incidence of abnormal WBC count in our patient population was statistically significant ($P < 0.001$).

One hundred twelve patients had Hg test results available. Fourteen (12.5%) patients had abnormally low Hg results. Population studies were used to determine the rates of anemia, defined as abnormally low Hg.[6] The percentage of patients with anemia in the general population is 7.7% after adjusting for age and sex distribution.[6] The absolute difference in the incidence of low Hg between this sample (12.5%) and the general population (7.7%) is 4.7%. This comparison was not statistically significant.

**TABLE 2.**
**Number of Abnormal Results for Each Laboratory Test Available in the Patient Chart**

| Test | Abnormal Results/Results Available (%) | Estimated Prevalence (or Incidence) in the General Population (%) |
|---|---|---|
| WBC count | 16/111 (14.4%) | 5% |
| Hemoglobin | 14/112 (12.5%) | 7.7% |
| TSH | 25/227 (11.0%) | 4.7% |
| Anti-TPO antibody | 16/70 (22.8%) | 13.0% |
| Anti-TG antibody | 10/73 (13.7%) | 11.5% |
| Fasting blood glucose | 9/224 (4.0%) | 6.9% |
| Syphilis | 2/220 (0.91%) | 0.0091% |
| Lyme disease | 5/225 (2.2%) | 0.039% |
| Laryngeal myasthenia | 6/166 (3.6%) | 0.014%–0.02% |
| ANA ≥1:80 | 2/217 (9.7%) | 13.8% |
| Rheumatoid factor | 24/228 (10.5%) | 10% |