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SHORT SCIENTIFIC COMMUNICATION

# Videostroboscopic findings in unilateral superior laryngeal nerve paralysis and paresis

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**OBJECTIVES:** Our aim was to present laryngovideostroboscopic findings in unilateral superior laryngeal nerve paresis and paralysis.

**STUDY DESIGN AND SETTING:** Retrospective case review, academic voice clinic.

**METHODS:** Blinded retrospective review of videostroboscopic recordings from cases confirmed by laryngeal electromyography.

**RESULTS:** Three cases of unilateral superior laryngeal nerve paresis and paralysis were identified. At rest, there were no common abnormal laryngeal findings. Upon phonation, common findings were ipsilateral vocal fold bowing and shortening, vocal process height asymmetry with the ipsilateral vocal process overriding the normal, and ipsilateral hyperadduction of the false vocal fold.

**CONCLUSIONS:** The common features noted in these cases of laryngeal electromyography−proved uSLNp could be used to make a presumptive diagnosis of this disorder.



There has been a longstanding interest in unilateral superior laryngeal nerve paresis and paralysis (uSLNp) because the clinical findings are subtle.[1-6] Although the clinical presentation and laryngoscopic findings have been debated for over a century, the only conclusion that can be made is that clinical heterogeneity is common. The wider use of laryngeal electromyography (LEMG) in clinical practice has recently allowed clinicians to more accurately identify uSLNp and has generated a renewed interest in defining this disorder.

Although videostroboscopic findings of uSLNp are rarely reported, laryngoscopic findings have been more extensively discussed. Reported findings have included posterior commissure rotation toward the ipsilateral side, ipsilateral shortening and contralateral elongation of the aryepiglottic fold, and shortening and bowing of the ipsilateral vocal fold.[1] We present a retrospective evaluation of the laryngoscopic and videostroboscopic findings in a case series of LEMG-proved uSLNp. The aim was to identify common features among these cases.

## MATERIALS AND METHODS

Institutional approval was obtained for the study. All cases with isolated uSLNp were identified from the clinic LEMG database. The selected cases had normal LEMG recruitment pattern of both thyroarytenoid muscles and one cricothyroid muscle. Videostroboscopy was performed using a 70-degree rigid endoscope attached to a CCD camera or a distal chip flexible endoscope with illumination from a stroboscopic light source. A comprehensive list of possible laryngoscopic and videostroboscopic findings in uSLNp was developed after review of the existing literature on this topic. Two laryngologists and a laryngology fellow blindly reviewed videostroboscopic recordings of the cases. They assessed five laryngeal parameters at rest and 14 parameters during at phonation of a sustained vowel /e/ (Table 1). The LEMG and videostroboscopy were performed within 2 weeks of each other.

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**Table 1**
**Assessment of the laryngovideostroboscopic parameters in uSLNp:**
**I = observation was noted *ipsilateral* to the side of superior laryngeal nerve weakness**
**C = observation was noted *contralateral* to the side of superior laryngeal nerve weakness**
**S = both vocal folds or both sides appear the *same***
**NC = *no consensus* was possible or the parameter could not be assessed**

| | Case 1 | Case 2 | Case 3 |
|---|---|---|---|
| A. Videostroboscopic parameters at rest: | | | |
| 1. Which vocal cord appears lower? | S | S | S |
| 2. Which side does the posterior commissure deviate? | C | S | S |
| 3. Which true vocal cord appears shorter? | S | S | S |
| 4. Which cord is more hyperemic? | S | S | S |
| 5. Which aryepiglottic fold appears shorter? | I | S | C |
| B. Videostroboscopic parameters during phonation: | | | |
| 1. **Which vocal cord appears lower**? | **C** | **C** | **C** |
| 2. Which side does the posterior commissure deviate? | NC | NC | NC |
| 3. **Which true vocal cord appears shorter**? | **I** | **I** | **I** |
| 4. Which cord is more hyperemic? | S | S | S |
| 5. Which aryepiglottic fold appears shorter? | I | S | C |
| 6. **Does one vocal cord appear bowed**? | **I** | **I** | **I** |
| 7. **Is there false vocal cord hyperconstriction on one side**? | **I** | **I** | **I** |
| 8. To which side does the epiglottis deviate? | S | S | S |
| 9. Does one side have weakness on abduction? | S | S | S |
| 10. Does one side have weakness on adduction? | S | S | S |
| 11. Does one cord appear relatively hyperfunctional? | C | S | I |
| 12. Does one arytenoid appear hyperfunctional? | C | S | I |
| 13. Which mucosal wave has greater excursion? | C | NC | NC |
| 14. Which mucosal wave appears faster? | C | NC | NC |

Bold indicates the laryngeal parameters that were found to be common among all the cases.

## RESULTS

Three cases of isolated uSLNp were identified. Case 1 was a 71-year-old man who had dysphonia following an episode of upper respiratory infection. LEMG revealed 50% reduced recruitment of the right cricothyroid muscle. Case 2 was a 53-year-old man with dysphagia and dysphonia after cervical spine surgery. LEMG revealed 50% reduced recruitment of the left cricothyroid muscle. A flexible endoscopic evaluation of swallowing showed swallowing better with head turned to the left, suggestive of left pharyngeal weakness. Case 3 was a 58-year-old man who noted sudden-onset dysphonia. LEMG showed complete absence of recruitment with only occasional potentials of the left cricothyroid muscle.

Results of the expert evaluation are presented in Table 1. At rest, with the vocal folds in a fully abducted position, no common features could be found. The vocal folds appeared to be of equal length, color, and height. Common features emerged during phonation and were most apparent upon frame-by-frame analysis of the video just before and at the onset of phonation. The ipsilateral vocal fold appeared shorter and bowed, and there was ipsilateral false vocal fold hyperadduction. This configuration was most appreciated just prior to the vocal processes contacting each other during phonation (Fig. 1). Other common features included ipsilateral false vocal fold hypertrophy and height asymmetry with the ipsilateral vocal process overriding the contralateral process during phonation. Contralateral false vocal fold hyperadduction was also seen but was less consistent than ipsilateral hyperadduction.

## DISCUSSION

Although clinical findings in uSLNp remains controversial, the early authors were astute clinicians who described nearly all the laryngeal findings we discuss here.[2-6] However, definitive diagnosis of uSLNp was not possible until LEMG methodology was developed.[4] It therefore cannot be known whether previously reported cases of uSLNp without LEMG data were possibly combined RLN/SLN paresis or paralysis. Nevertheless, multiple authors have made observations such as deviation of the posterior commissure, vocal fold height asymmetry, and ipsilateral vocal fold bowing. Our study is a small case series and definitive conclusions cannot be made because it is possible that uSLNp presents with heterogeneity of laryngoscopic and stroboscopic findings. However, we have identified some common features that may be predictive of unilateral SLNp. The significant findings were bowing and shortening of the ipsilateral vocal fold, height asymmetry with the ipsilateral vocal process overriding the normal vocal process, and ipsilateral hyperadduction/hypertrophy of the false vocal fold. These

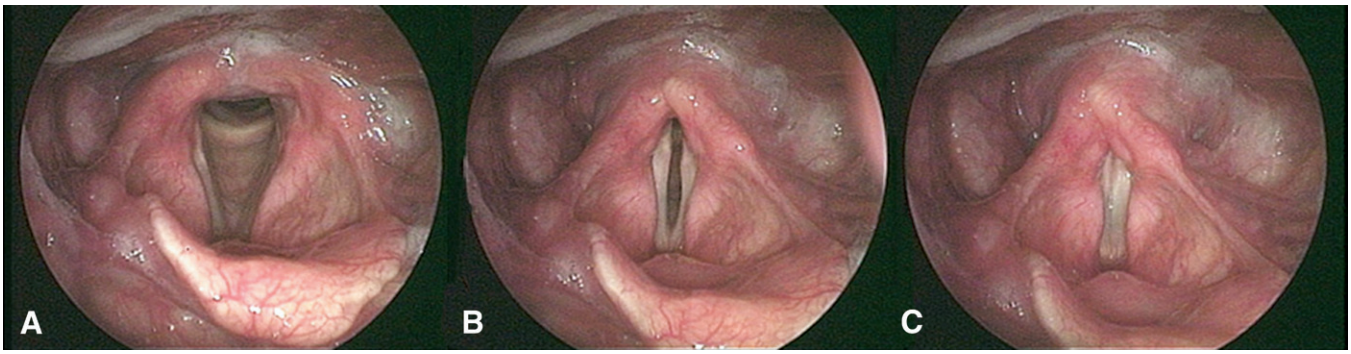


**Figure 1** Glottic configuration in uSLNp (Case No. 3) at rest **(A),** one frame prior to glottic closure **(B)**, and at the onset of phonation **(C)**. The *left* cricothyroid muscle is paralyzed. Note the longer ipsilateral AE fold, hyperadduction of the left false vocal fold, bowing of the ipsilateral vocal fold seen best prior to glottic closure. Height asymmetry with a higher level of the ipsilateral vocal process is seen best at onset of phonation. There is perhaps a subtle rotation of the posterior commissure towards the paralyzed left side.

features were appreciated only during phonation. That is not surprising since the CT muscles are typically not contracting at rest.

The discussion of uSLNp is of more than just academic interest. Patients with this disorder clearly experience varying levels of dysphonia.[7] Proper diagnosis helps the clinical team understand the underlying pathology and is important for planning treatment. Although LEMG is needed to confirm the diagnosis of uSLNp, it is useful to have videolaryngoscopic guidelines that can help in making a working diagnosis. To date, videostroboscopic features of LEMG proven SLNp have not been systematically evaluated. When LEMG is added to the diagnostic repertoire, subtle paresis of the SLN and RLN often turns out to be the etiology in cases of dysphonia of otherwise unclear etiology. Further elucidation of the videolaryngoscopic findings in laryngeal paresis is useful clinically in rendering a correct diagnosis and treatment planning as well as furthering our understanding of laryngeal physiology.

## CONCLUSION

In this small case series of LEMG-diagnosed uSLNp, videostroboscopic analysis during phonation found ipsilateral vocal fold shortening and bowing, ipsilateral false vocal fold hyperadduction, and vocal fold height asymmetry with the ipsilateral vocal process overriding the opposite vocal process. These features could be used by the clinician to make a presumptive diagnosis of uSLNp.

## REFERENCES

1. Abelson TI, Tucker HM. Laryngeal findings in superior laryngeal nerve paralysis: a controversy. Otolaryngol Head Neck Surg 1981;89:463–70.
2. Mygind H. Die Paralyse des M. Cricothyreoideus. Arch Laryngol 1906; 18:403–18.
3. Beyer TE. Traumatic paralysis of the cricothyroid muscle. Laryngoscope 1940;51:296–8.
4. Faaborg-Andersen K, Jensen AM. Unilateral paralysis of the superior laryngeal nerve. Acta Otolaryngol 1964;57:155–9.
5. Ward PH, Berci G, Calcaterra TC. Superior laryngeal nerve paralysis: an often overlooked entity. Trans Am Acad Ophthalmol Otolaryngol 1977;84:78–89.
6. Bevan K, Griffiths MV, Morgan MH. Cricothyroid muscle paralysis: its recognition and diagnosis. J Laryngol Otol 1989;103:191–5.
7. Rubin AD, Praneetvatakul V, Heman-Ackah Y, et al. Repetitive phonatory tasks for identifying vocal fold paresis. J Voice 2005;19(4):679–86.