

Laryngeal Imaging

Physical Examination of the Larynx

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The Value of Laryngeal Stroboscopy

Provides information regarding

- Ability of system to achieve an efficient prephonatory/nearly closed configuration
- Pliability of the cover
- Stroboscopy refers to the observation of vocal fold vibratory characteristics and not the observation of vocal fold abduction and adduction

Courey, 2006

Laryngeal Stroboscopy: Training for Professionals

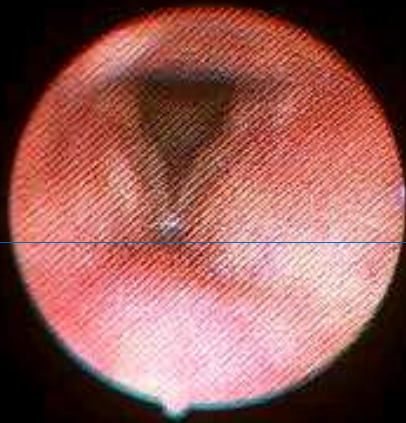
- “Although specific experiences may differ among professionals, the interpretation and clinical use of laryngeal stroboscopy information in the assessment and treatment of phonatory function disorders is highly specialized and requires substantial training and knowledge beyond that believed to be available in most graduate speech-language pathology or laryngology residency programs.”

- Leonard, R.J. (1992). Use of laryngeal imaging procedures. *Asha*, 34, 270.

Evaluation: Instrumental Assessment

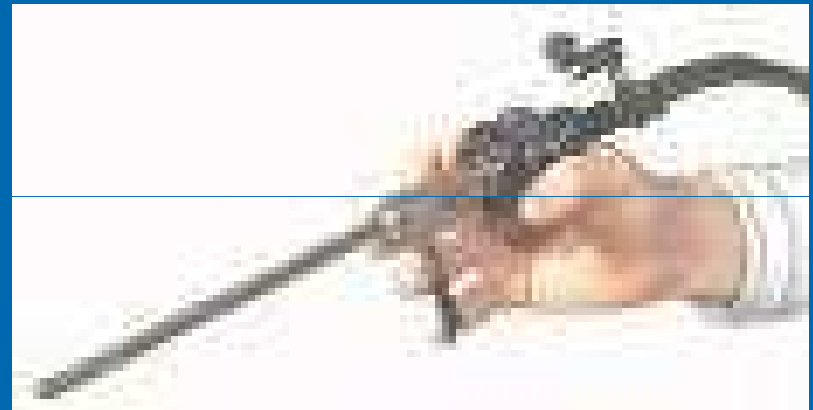
- Ideally, both a rigid and flexible video stroboscopy should be performed
- Rigid endoscopy – looking for vocal fold edge/pliability/wave, glottic closure, open/close phase
- Flexible endoscopy --- looking for vocal fold parameters and supraglottic behavior during actual speaking and singing
- Sustained /i/ at **varied pitch and loudness** – essential to correct diagnosis

Digital vs. Fiberoptic Flexible Nasoendoscopy



Rigid Endoscope

- Best image clarity
- 70° or 90° angle lens
- Hyperactive gag response may prevent use
- Often tension artifact
- Normal speech tasks not possible



Performing Endoscopy

- Topical anesthetic and decongestant
- Either patient or examiner holds tongue w/ gauze
- Scope inserted to the base of tongue and angled downward
- “Thinker” pose
- Sustained /i/ at varied pitch and loudness



Light Source - Halogen

- Halogen
 - Steady
 - Continuous light
 - Allows clear visualization of anatomical structures
- Limitations
 - Vibratory behavior of the vocal folds cannot be seen



Stroboscopy

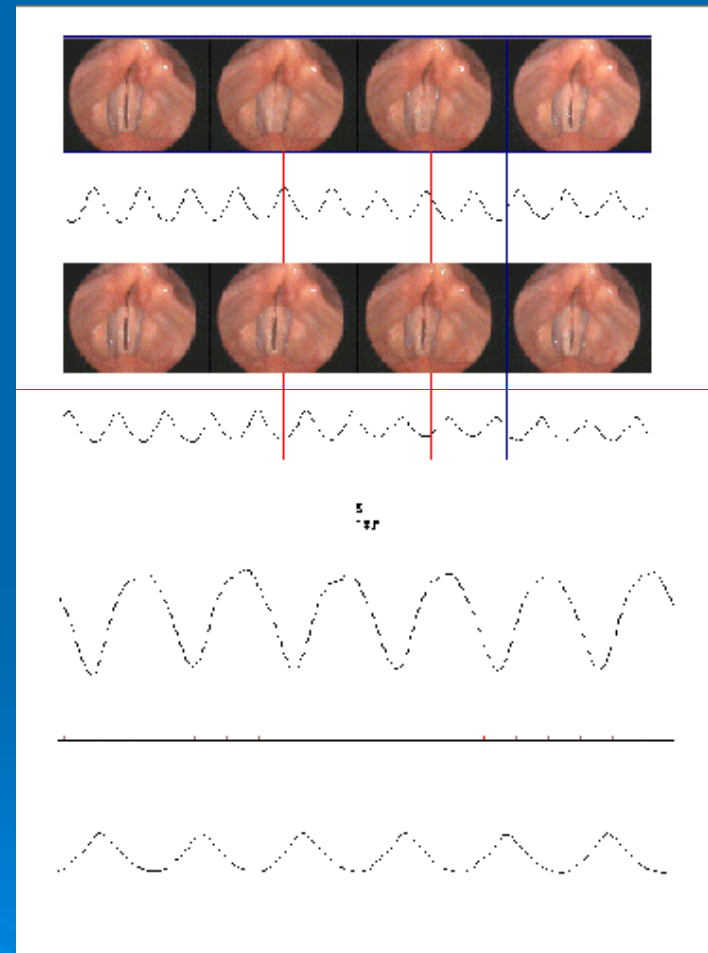
- Founded on Talbot's Law (video)
- A contact microphone reads fundamental frequency (pitch)
- Uses a flashing xenon light to sample many single points along multiple waveforms in accordance with pitch produced by patient
- Allows a locked or traveling image of the folds

Halogen vs. Xenon Light



Stroboscopy

- In traveling mode, light flashes at different points in the vibratory cycle – slow motion effect
- In locked mode, light flashes at same point in each cycle – image appears still



Locked/ Traveling Modes



Scope Selection

➤ Rigid Examination

- Ideal if close view of pathology is needed
- Excellent for evaluating vibratory patterns
- May elicit abnormal muscular movement secondary to unnatural positioning

➤ Flexible Examination

- Offers a more natural production
- Allows observation of voice production during connected speech
- Subject to intermittent changes in view as patient alters position of the velum, base of tongue, or swallows

Stroboscopy - Disadvantages

- Representation of vibration – not actual cycle
- Two-dimensional
 - Superior surface view - only
 - Unable to evaluate lower lip region when upper lip region is closing or closed
- If patient is too dysphonic, pitch recording, and therefore strobe, not possible

Normal Vibratory Characteristics

- A universal rating system and/ or scale does not exist
- Evaluation is subjective and dependent on the skill of the examiner
- Videostroboscopic Examination of the Larynx, M. Hirano and D. Bless, 1993, Singular Publishing
- Phase closure
- Amplitude
- Mucosal wave
- Symmetry
- Periodicity
- Vertical plane

SAV and SERF

Communication Sciences
Voice Evaluation Laboratory

Tape no. _____

STROBOSCOPIC ASSESSMENT

Name: _____ (M or F) Age: _____

Clinical Diagnosis _____

Smooth	1	2	3	4	5	COMMENTS FO _____ SPL _____ Voice quality _____	
Rough	1	2	3	4	5		
Voice Fold	R	1	2	3	4	5	
Edge	L	1	2	3	4	5	

Complete

Ant. Chnk

Irreg

Bowing

Post. Chnk

Hour-glass

In-complete

Glottic Closure

Phase Closure

Open phase predominates (whisper) 1 2 Normal 3 4 Closed phase predominates (hyperadduction) 5

Vertical level of approx. Equal 1 R. lower 2 L. lower 3 Questionable 4

Amplitude	R	Normal 1	Slightly Decreased 2	Moderately Decreased 3	Severely Decreased 4	No Visible Movement 5
	L	1	2	3	4	5

Mucosal Wave	R	Normal 1	Slightly Decreased 2	Moderately Decreased 3	Severely Decreased 4	Absent 5
	L	1	2	3	4	5

Vibratory Behavior	R	Always fully present 1	Partial absence sometimes 2	Partial absence always 3	Complete absence sometimes 4	Complete abs. always 5
	L	1	2	3	4	5

Phase Symmetry	Regular 1	Sometimes irregular 2	Mostly irregular 3	Always irregular 4
Periodicity (regularity)	Regular 1	Sometimes irregular 2	Mostly irregular 3	Always irregular 4

Ventricular Folds: Symmetry of movement: 1. R-L 2. L-R 3. Equal

Movement: Normal 1 2. Mod. Compress 3 Full Compress 4

Arytenoids: Symmetry of movement: 1. R-L 2. L-R 3. Equal

Movement: Normal 1 Fair 2 Poor 3

Hyperfunction: 1. not present 2. sometimes present 3. always present

Based on a form developed at the University of Wisconsin Voice Clinic, Madison, WS, Diane Bless, Ph.D., Director.

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Stroboscopy Evaluation Rating Form (SERF)

Bruce J. Poburka, Ph.D.

Rate: _____
Client: _____
Date: _____

Amplitude
(Rate @ normal pitch & loudness)

Right: _____% Left: _____%
Fo: _____

Mucosal Wave
(Rate @ normal pitch & loudness)

Right: _____% Left: _____%
Fo: _____

Non-vibrating Portion
(shade in affected areas)

Right _____ Left _____

Supraglottic Activity
(ignore voice onsets)

A-P: _____

ML: _____

A

FIG. 1. A. The Stroboscopy Evaluation Rating Form (SERF). (continued)

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Visual Perceptual Judgements

- Not vibratory characteristics, but simple observation of
 - Overall structural appearance of the larynx, including remarks on color, mucous
 - Symmetry and movement of arytenoids
 - Vocal fold edge (smooth, rough, edema, lesion, etc.)
 - Glottic closure pattern
 - Supraglottic hyperfunction

Glottic Closure Pattern

- Complete
- Incomplete
- Bowed
- Hourglass
- Anterior gap
- Posterior gap
- Spindle gap



Supraglottic Hyperfunction (Muscle Tension Dysphonia)



Amplitude

- The extent of vertical-lateral excursion, the extent of lateral displacement from midline
- R/L judged separately
- Normal, mild-mod-severely reduced, absent
- Presence of lesion, edema, stiffness, hyperfunction will affect amplitude
- The product of subglottic pressure

Amplitude



Mucosal Wave

- The longitudinal flexibility of the fold, seen as a traveling wave on vibration
- Absence of mucosal wave described as a “non-vibrating portion” or “adynamic segment”
- May appear increased in cases of paresis/paralysis secondary to flaccidity
- R/L judged separately
- Normal, mild-mod-severely reduced, absent

Mucosal Wave



Symmetry

- Based on the degree to which the two folds appear as mirror images of one another
- Consider timing of opening, closing, approach to midline, excursion, etc.
- Symmetrical, sometimes, mostly, always irregular



Symmetry

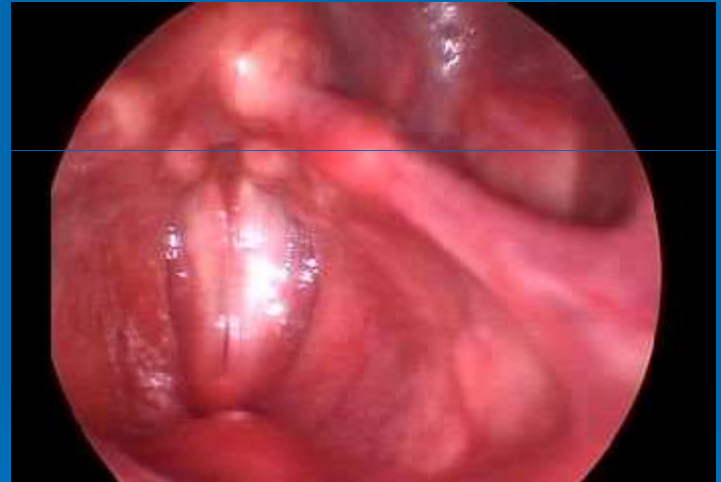


Periodicity

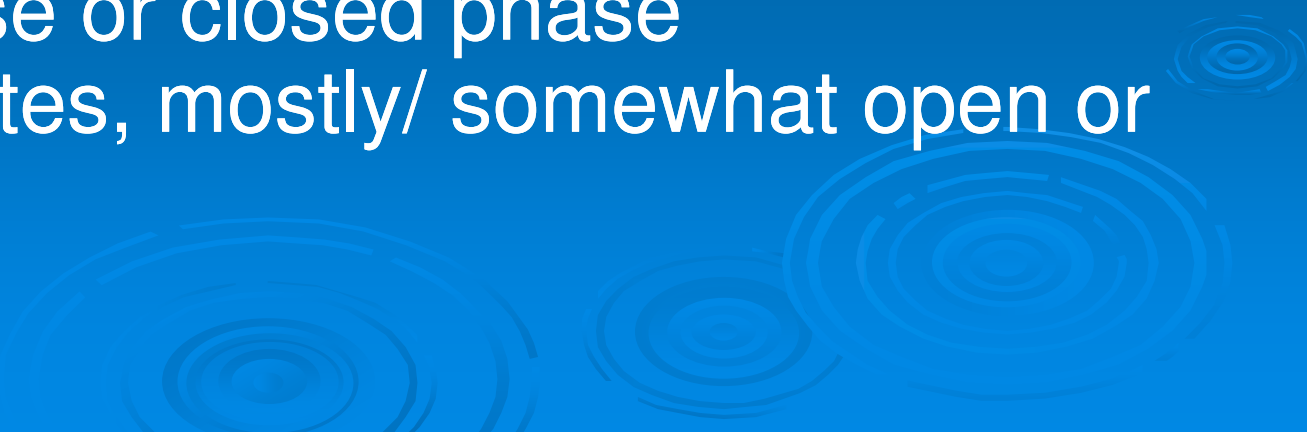
- The regularity of successive apparent cycles of vibration
- Periodic vibration is uniform in time and amplitude, aperiodic is not
- Periodicity reflected by a static image in the “locked” mode
- Some application in diagnosis of SD



Periodicity



Phase Closure

- Describes the ratio of open to closed phase
 - Open phase may be increased in cases of presbylarynx, glottal lesion, paralysis
 - Closed phase may be increased in cases of hyperfunction
 - Open phase or closed phase predominates, mostly/ somewhat open or closed
- 

Phase Closure



Vertical Plane/ Phase Difference

- Vocal folds should meet in the same horizontal plane
- A vertical discrepancy affects upper lip/ lower lip adduction, impacting other vibratory characteristics
- Vertical plane may be affected by paralysis, CA joint injury
- Equal, right/ left lower

Vertical Phase Difference

