Voice Dysfunction in Neurologic Disorders

There are numerous neurologic disorders that can result in voice dysfunction. The most common conditions that might be seen by the otolaryngologist are spasmodic dysphonia (SD), essential tremor, and Parkinson’s disease. If a neurodegenerative disorder is suspected, it is important to arrange a neurologic evaluation for appropriate testing and management of the underlying condition.

SPASMODIC DYSPHONIA

Anatomy & Physiology
- Spasmodic dysphonia (SD) is a focal, action-specific dystonia characterized by intention-induced spasms. In a patient with suspected SD, the vocal tract should be evaluated to identify any abnormalities.

Assessment
- Voice assessment should include reading of a phonetically balanced passage such as the “rainbow passage”, as well as phrases that can trigger a strained/strangled quality (i.e. “We eat apples and eggs”) or breathy breaks (i.e. “Harry hit the hammer hard”). Studies have shown that auditory cues are more likely to result in correct diagnosis of SD in comparison to video cues.

Pathophysiology
- SD has classically been thought of as a disorder of central motor processing and is categorized into three major groups: adductor which comprises 80% of affected patients, abductor, and mixed. Adductor SD affects the thyroarytenoid-lateral cricoarytenoid (TA-LCA) complex while abductor SD affects the posterior cricoarytenoid (PCA) muscles.

Treatment
The most commonly utilized treatment is botulinum toxin. This causes a temporary denervation of the TA-LCA complex in adductor SD or the PCAs in abductor SD. The injection is repeated once the botulinum toxin effect fades (generally around 3 months).


EMG-guided botulinum toxin injections are the most common approach but there are other approaches utilizing fiberoptic assistance that can be performed in the absence of an EMG.


Supraglottic botox has shown good voice outcomes with decreased breathiness post-injection.


Selective laryngeal adductor denervation-reinnervation is an alternative to botox that has demonstrated good voice outcomes and long-lasting results.


ESSENTIAL TREMOR

Anatomy & Physiology

- Essential tremor typically involves the head and limbs but can also involve various parts of the vocal tract including the palate, pharynx, and larynx. The tremor is regular and not-task specific with a frequency between 4-12 kHz.


Assessment

- All portions of the vocal tract (palate, pharynx, and larynx) should be assessed during a fiberoptic exam by having the patient hold out a sustained “ee”. Jaw tremor should also be noted as this can significantly impact the voice.

Pathophysiology
Disease presentation appears to be bimodal with a small percentage of these cases manifesting in the first two decades of life. In some patients, there also appears to be a familial association with transmission in an autosomal-dominant pattern with variable penetrance.


**Treatment**

- Treatment options include voice therapy or botulinum toxin injections to the thyroarytenoid-lateral cricoarytenoid (TA-LCA) complex and/or strap muscles.

- Primidone and beta-blockers can improve limb tremor, but some patients have shown improvement in vocal tremor with high doses of propranolol.

**PARKINSON’S DISEASE**

**Anatomy & Physiology**

- Parkinson’s disease is characterized by the triad of rigidity, tremor, and bradykinesia. In the larynx, it can impact the structure of the vocal folds. Vocal fold atrophy is a very common finding in this disease.

**Assessment**

- Voice assessment will typically reveal a weak and monotone voice quality. Dysarthria and tremor may also be present.

- A fiberoptic exam should be performed to evaluate for atrophy which can be suggested by vocal fold bowing, prominent vocal processes, and deep ventricles. Mobility should also be assessed as this can be affected in certain neurodegenerative disorders.
If stroboscopy is available, this can help assess glottic closure and competency.

Pathophysiology

- Parkinson’s disease is caused by degeneration within the nigrostriatal tracts of the basal ganglia ultimately leading to a decrease in the release of dopamine. It can present at any age but most commonly is seen in the 5th or 6th decade of life.

Treatment

- Lee Silverman Voice Treatment has shown good improvement in voice with benefits that can last up to 2 years. Therapy is directed at improving vocal fold adduction and respiratory effort.

- Deep brain stimulation (DBS) or pallidotomy is sometimes used in medically refractory cases of PD, however, there has been some data suggesting that DBS may actually negatively impact voice outcomes.

- In certain cases, injection augmentation or medialization laryngoplasty can be performed in order to alleviate glottic insufficiency symptoms.