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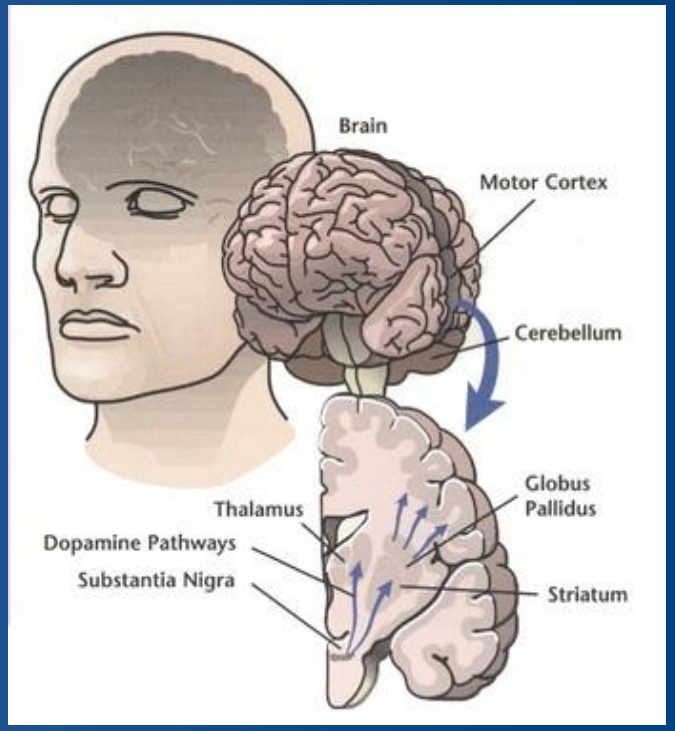
Parkinson's Disease Related Dysphonia:

A Multidisciplinary Approach

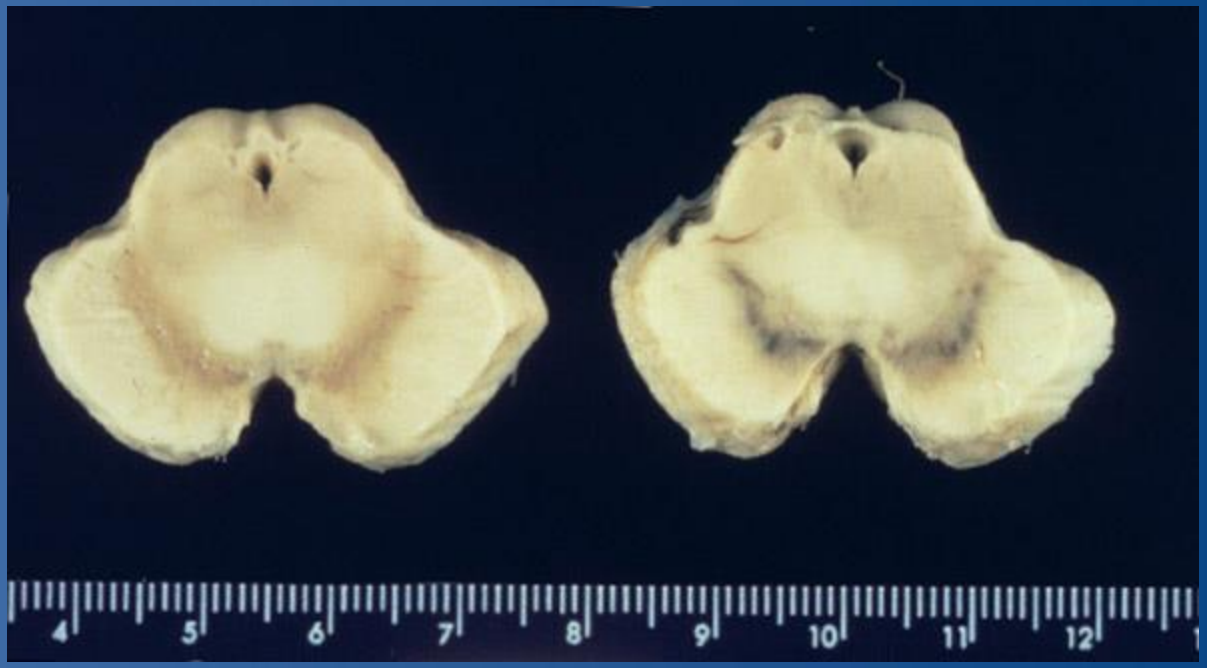
Idiopathic Parkinson's Disease (IPD)

- Progressive neurodegenerative disorder
- Affects approximately 2 million Americans
- Hallmark symptoms
  - Resting tremor
  - Bradykinesia
  - Muscle Rigidity



- >70% with dysphonia; 30% describe as most debilitating deficit (Hartelius, et al 1994)

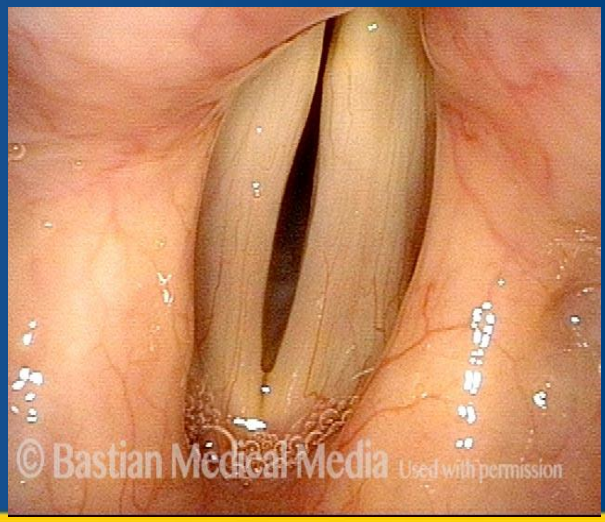
Pathogenesis of IPD



- Loss of melanin-containing dopaminergic neurons in the substantia nigra
- Dysfunction of basal ganglia

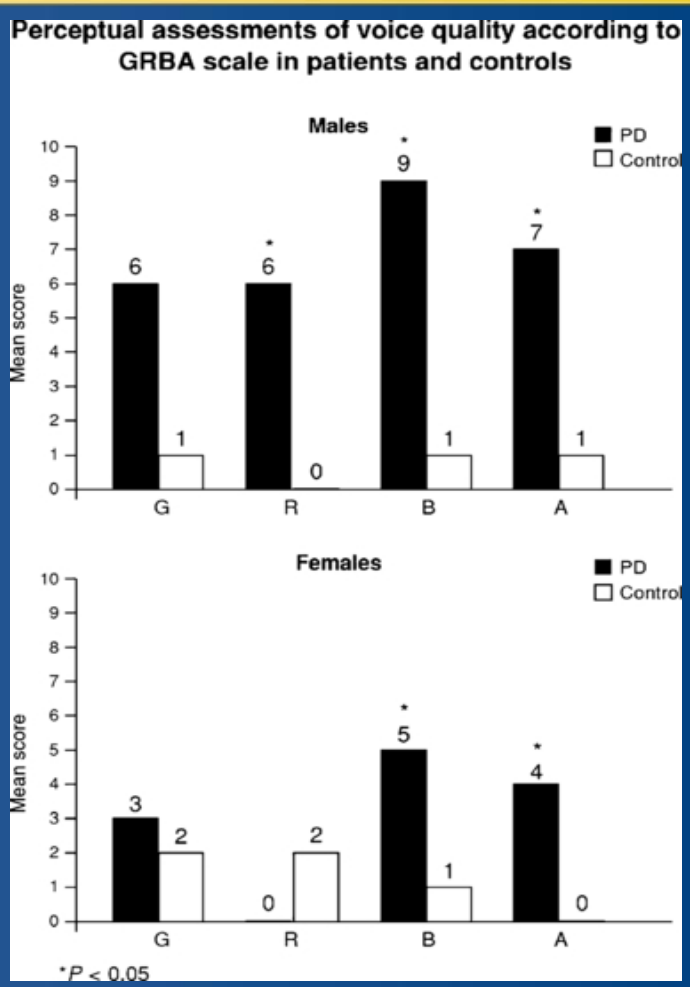
Impact on Laryngeal Function

- Lack of dopaminergic inhibition
- Altered muscular control, increased laryngeal tension
- “Defective” intrinsic musculature
  - Does not improve as much as expected w/ Dopa therapy (Goberman, et al 2005)
- Characteristic bowing of TVC
- Persistent glottic gap
- Mucosal wave preserved
- Normal vocal process excursion



Characteristics of Phonation in IPD: Perceptual Changes

- Dysarthria-extralaryngeal component
- Decreased variation
- Breathiness
- Increased roughness
- Increased asthenia
- Voice tremor
- Higher mean VHI



Midi, et al 2007

Characteristics of Phonation in IPD: Acoustic Changes

- Maximum phonation time: shorter
- Diadochokinetic rate: slower
- Jitter: higher = more roughness
- Shimmer: higher
- Phonation threshold pressure: increased
- Pitch range: decreased

Correlations between overall severity of IPD and Voice Changes

Voice Assessment	UPDRS	Correlation
GRBAS	Total UPDRS	None
VHI	Motor component	+
TVC Adduction	Rigidity	None
Laryngeal Tremor	Resting Tremor	+
Phonation instability	Postural instability	+
MPT	Rigidity	-
Speech DDK	Movement DDK	None

MULTI-DISCIPLINARY TREATMENT OF PARKINSON'S-RELATED DYSPHONIA

Speech-Language Pathology Intervention

Presented at Johns Hopkins Voice Center
Greater Baltimore Medical Center
Laryngeal Stroboscopy Grand Rounds
February 14, 2014

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MEDICINE

JOHNS HOPKINS
HEALTH SYSTEM

Presented by: Donna C. Tippett, MPH, MA, CCC-SLP

Hypokinetic Dysarthria in Parkinson's Disease

- Characteristics
  - Reduced vocal loudness; monoloud
  - Monotone
  - Breathy, hoarse phonation
  - Imprecise articulation
  - Short rushes of speech
  - Dysfluency

Darley et al, 1969, 1975

Hypokinetic Dysarthria in Parkinson's Disease

- Mechanism
  - Reduced muscle activation
  - Abnormal scaling and maintenance of movement amplitude
  - Sensory processing deficits
  - Internal cueing deficits
  - Impaired self-monitoring and self-regulation

Ramig et al, 2008

Behavioral Therapy for Dysarthria

- ***Is***
  - Mainstay of speech-language pathology rehabilitation
- ***Can***
  - Improve physiologic function
  - Introduce compensatory strategies
- ***Should be***
  - Evidence based
  - Person/patient centered

Lee Silverman Voice Treatment

- Introduced in 1988 by Ramig et al.
- Intensive, high-effort Parkinson-specific tx
  - Trains amplitude (increased vocal loudness), without strain or hyperfunction, as a single motor control parameter
  - Recalibrates motor and sensory system to prevent under-scaling
  - Facilitates compensation via self-regulation

Sapir et al, 2011

Lee Silverman Voice Treatment

- Dosage
  - 4 days/week/4 weeks (16 sessions/month)
  - Minimum 15 repetitions/task
  - 50-60 minute sessions
  - Independent practice
- Focus: LOUD

- Treatment session
  - First half: Daily variables
    - 15 reps MPT in good quality, loud voice
    - 15 reps high pitched /i/
    - 15 reps low pitched /a/
    - 5 reps of 10 functional phrases/sentences using LOUD voice

Lee Silverman Voice Treatment

- Dosage
  - 4 days/week/4 weeks (16 sessions/month)
  - Minimum 15 repetitions/task
  - 50-60 minute sessions
  - Independent practice
- Focus: LOUD

- Treatment session
  - Second half: Variable speaking tasks
    - 10 reps of 20 phrases/sentences
    - Increase task complexity from words to conversation
    - Increase duration of speaking task
    - Add distractions, noise, etc

Lee Silverman Voice Treatment

- Evidence based
  - Embodies fundamental principles of exercise physiology
- Person/patient centered
  - Achieves saliency by tailoring speech materials, homework and carryover assignments to individual's interests, hobbies, communication goals

Theodoros & Ramig, 2011; Sapir et al, 2011

Exercise Physiology Principles

- Goal selection
- Specificity of training
- Overload/progression

Clark, 2003

Goal Selection

- Strength
  - Amount of force produced during single bursts or contractions
- Endurance
  - Amount of force that can be sustained over longer periods of time
- Power
  - Speed at which force is produce

Clark, 2003

LSVT and Goal Selection

- Focus: Strength and endurance
- Addresses intensity
  - 16 sessions/month,15 reps/task
  - Targets increased vocal loudness, phonation duration
- Addresses task complexity
  - Task hierarchy: words to connected speech

Exercise Physiology Principles

- Goal selection
- Specificity of training
- Overload/progression

Clark, 2003

Specificity of Training

- Muscle response is altered by the particular task used for training
- Muscles should be conditioned during the task that you are trying to improve

Stathopoulos & Duchan, 2006

Specificity of Training

- Transference
  - Rationale for using a nonspecific exercise to improve performance in a related, more specifically defined, functional task

Sapienza & Wheeler, 2006

LSVT and Specificity

- Goal: increased vocal loudness in functional speech tasks, daily communication
  - Transference principle
    - Daily variables
  - Specificity
    - Hierarchy of speech tasks
    - Conversation practice

Exercise Physiology Principles

- Principles
  - Goal selection
  - Specificity of training
  - Overload/progression

Clark, 2003

Overload/Progression

- Muscle should be challenged beyond some threshold level to get the desired conditioning response

Stathopoulos & Duchan, 2006

LSVT and Overload/Progression

- High effort approach
- Maximum sustained phonation
  - Vocal fold adduction
- Highest and lowest pitch drills
  - Flexibility

Person Centered Approach

- Historically, medical model or therapist centered
  - Tasks target specific domains
  - Emphasizes impairment
  - May not translate to functional change

Leach et al, 2010

Person Centered Approach

- Authentic involvement of patients, families, caregivers
- Engaging experiences
- Addresses individual needs, circumstances
- Collaborative process
- Consistent with WHO framework

Leach et al, 2010

World Health Organization Framework

- Impairment
  - The abnormality of structure or function at the organ level
- Disability
  - The effect that the impairment has had on function, such as reduced ability to speak on the phone or order in a restaurant
- Handicap
  - The effect that the disability can have on the ability to participate in social situations, such as being excluded or restricted from an activity in the home or community

Assessment: Disability and Handicap

- What bothers you about your speech/voice?
- When do you have the most difficulty being understood?
- Do you avoid any situations because of your speech/voice?
- How has your speech/voice affected interactions with others?

Assessment: Societal Disadvantage

- Is the patient able to take part in activities in the home, school, job, community?

Treatment Goals

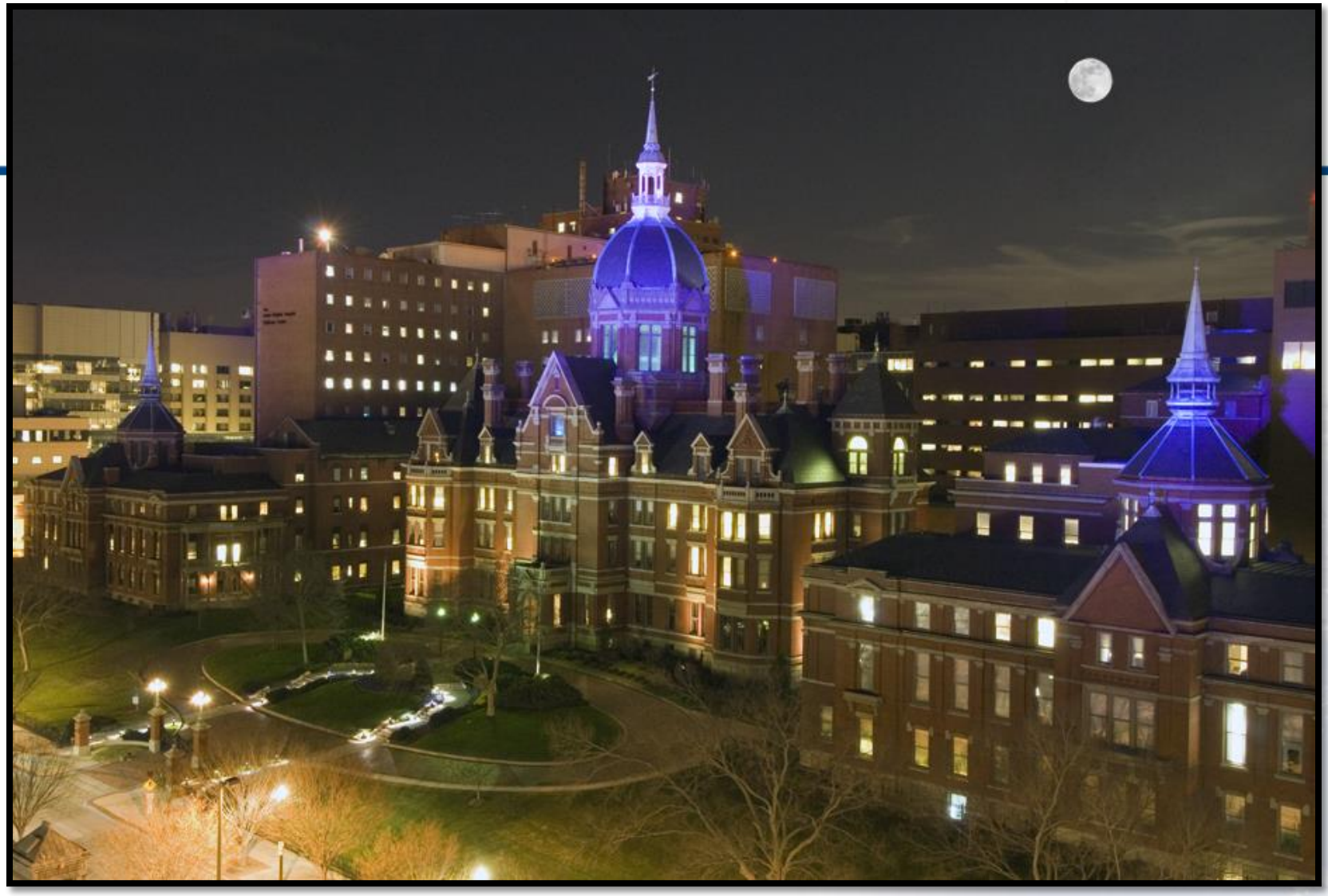
- Go beyond specific modality
- Activity goal
  - Speak in sentences to order in a restaurant
- Participation goal
  - Engage in a parent-teacher conference

LSVT and Saliency

- Incorporates personal interests
- Patient identifies phrases for home practice

LSVT Options

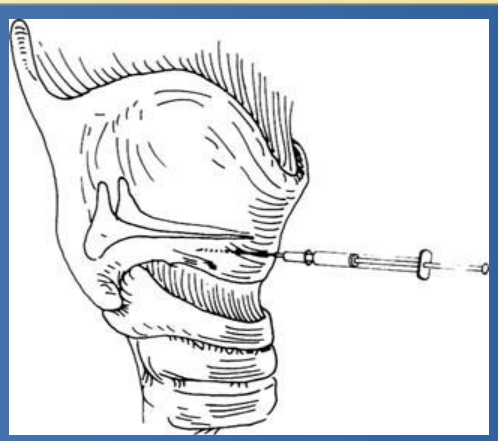
- Videophone
  - Tindall et al, 2008
- Web camera and videoconferencing via Skype
  - Howel et al, 2009
- LSVT LOUD Companion
  - Halpern et al, 2012

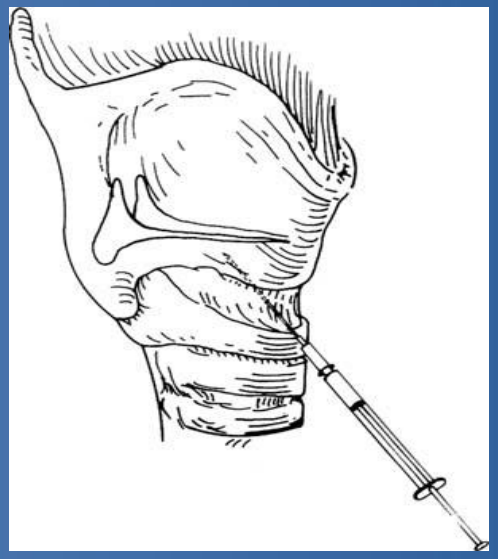


IPD and Candidacy for Phonosurgery

- Good vocal fold mobility (normal vocal process excursion)
- Progressive disorder
- Difficulty with cooperation for procedures
- Not candidates for general anesthesia

Surgical Therapy for PRD

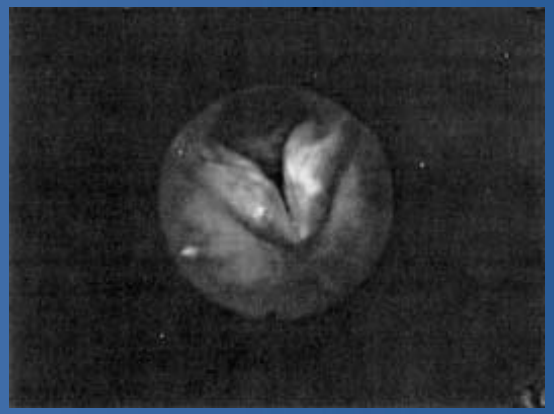


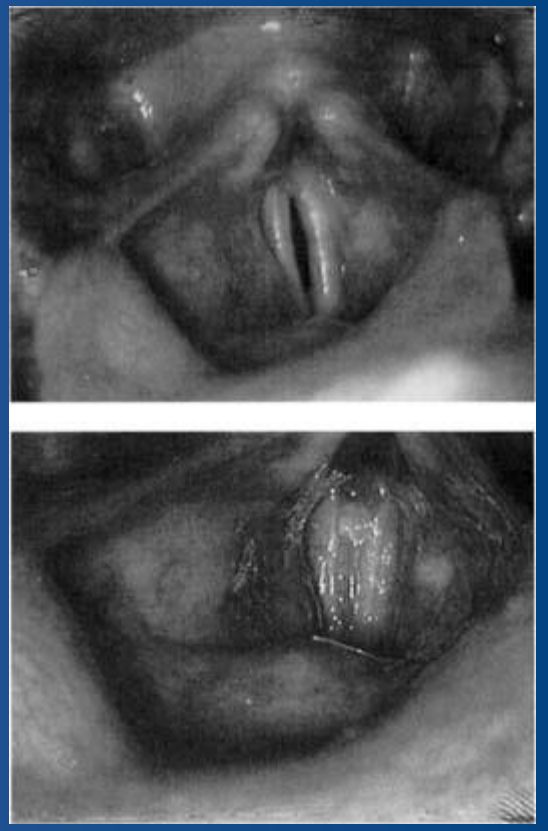


Necessary traits of intervention:

- Easily revisable
- Requires little patient cooperation
- Does not interfere with arytenoid movement
- Does not require general anesthetic

Injection Laryngoplasty: Collagen



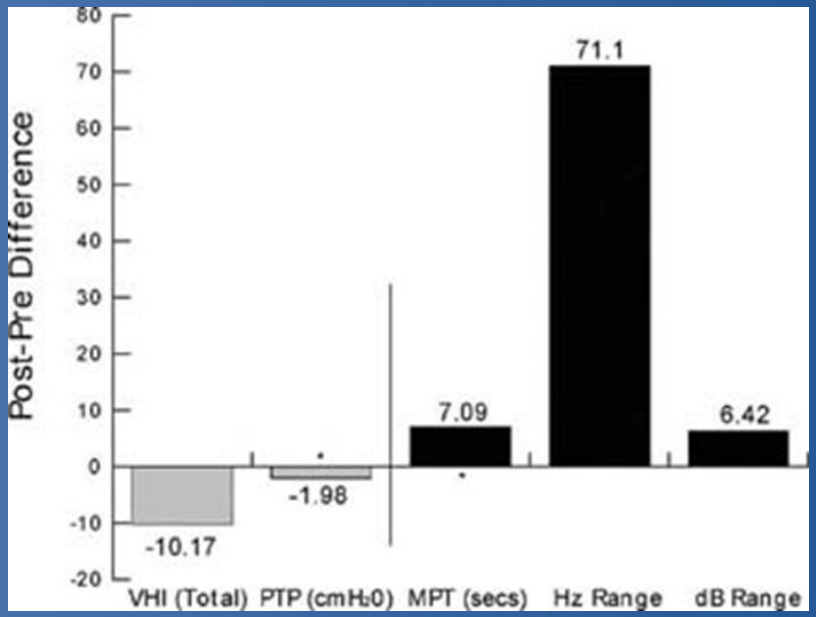


- N = 35
- Technique: Trans-cartilage or Trans-cricoid; nasopharyngoscopic visualization

Results

- No major complications
- 75% of subjects: increased satisfaction with voice
  - Based on 5 factor survey (loudness, clarity, social embarrassment, tolerance of injection, overall satisfaction)
- Avg length of benefit: 12 weeks (R: 4-52)

Injection laryngoplasty: Collagen



- N=6
- Transoral injection
- No complications
- 5/6 improved VHI
- Aerodynamic/Acoustic testing
  - Decreased PTP
  - Improved MPT
  - Improved loudness
  - Improved pitch range

Conclusions

- Parkinson's hypophonia is a complex problem
- IPD patients poor surgical candidates
- Laryngoplastic procedures have no impact on dysarthria/articulation
- Decreasing glottic gap may aid vocal efficiency
- Further studies are required

References

1. Berke GS, Gerratt B, Kreiman J, Jackson K. Treatment of Parkinson hypophonia with percutaneous collagen augmentation. Laryngoscope. 1999 Aug;109(8):1295-9.
2. Hartelius L, Svensson P. Speech and swallowing symptoms associated with Parkinson's disease and multiple sclerosis: a survey. Folia Phoniatr Logop. 1994;46(1):9-17.
3. Goberman AM. Correlation between acoustic speech characteristics and non-speech motor performance in Parkinson Disease. Med Sci Monit 2005. 11:109-16.
4. Midi I, Dogan M, Koseoglu M, Can G, Sehitoglu MA, Gunal DI. Voice abnormalities and their relation with motor dysfunction in Parkinson's disease. Acta Neurol Scand. 2008 Jan;117(1):26-34. Epub 2007 Nov 20.
5. Sewall GK, Jiang J, Ford CN. Clinical evaluation of Parkinson's-related dysphonia. Laryngoscope. 2006 Oct;116(10):1740-4.