Combined Modality Treatment of Adductor Spasmodic Dysphonia (ADSD)

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ASHA 2008

Acknowledgements
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Research funding, academic support provided by:
- NIH / NIDCD (Kirschstein NRSA Individual Predoctoral Fellowship, E. Silverman)
- National Spasmodic Dysphonia Association (Small Research Grant Program)

Treatment Options for ADSD
- Surgical
  - RLN procedures
  - Bilateral denervation-reinnervation
  - Companion procedures
  - Other procedures
- Chemodenervation (BTX-A or BTX-B)
- Alternative
  - Acupuncture
  - Chiropractic
- Behavioral
  - Combined Modality – BTX + behavioral (Murry & Woodson, 1995)

Combined Modality
Murry & Woodson, 1995
- 27 participants with ADSD
- 2 groups:
  - Botox only
  - Botox + voice therapy
- Variety of acoustic measures made at pre and re-injection
- Voice Rx group - 5 session course of voice therapy between pre and post injection; additional measures made at reinjection

<table>
<thead>
<tr>
<th></th>
<th>BTX plus voice therapy</th>
<th>BTX only</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD F0</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Jitter</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Shimmer</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SNR</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Those who received voice therapy had a greater magnitude of change in acoustic measures

**METHODOLOGICAL ISSUE**

Self-assigned to BTX only or BTX plus voice therapy groups based on voice status ~3 weeks post injection

Current Project
(1) Examine combined modality treatment and response over time
(2) Apply randomization
(3) Use behavioral placebo as control for voice therapy
(4) Use signal typing for characterizing ADSD and response to treatment(s)
(5) Examine Quality of Life in response to treatment(s)
Research Questions

- Would BTX plus voice therapy produce benefits significantly different from those exposed to BTX alone or BTX plus a sham voice therapy?

- **Individuals who received BTX plus voice therapy would demonstrate significant improvements in measures of interest, over course of injection cycle, compared to those who received BTX alone or BTX plus a sham voice therapy.**

Participants: Recruitment & Selection

- > 18 years old
- Diagnosis of ADSD (otolaryngologist or neurologist)
- > 6 month symptom duration
- No prior BTX treatment, now desiring BTX treatment
- No prior surgical or other treatment for ADSD
- No history of other voice or speech disorder
- Medically, socially, psychologically stable over past year
- Willing and able to participate in voice (or sham) therapy if assigned to do so

Participants (N=31)

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Demographics:</th>
</tr>
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<tbody>
<tr>
<td>Random assignment to experimental groups</td>
<td><strong>Gender</strong></td>
</tr>
<tr>
<td>BTX only</td>
<td>% male 16.13</td>
</tr>
<tr>
<td>BTX plus voice therapy</td>
<td>% female 83.87</td>
</tr>
<tr>
<td>BTX plus sham therapy</td>
<td><strong>Age (yrs.)</strong></td>
</tr>
<tr>
<td></td>
<td>Median 50.00</td>
</tr>
<tr>
<td></td>
<td>Mean 48.45</td>
</tr>
<tr>
<td></td>
<td>SD 15.08</td>
</tr>
<tr>
<td><strong>Duration (yrs.)</strong></td>
<td>Median 2.50</td>
</tr>
<tr>
<td></td>
<td>Mean 6.27</td>
</tr>
<tr>
<td></td>
<td>SD 7.62</td>
</tr>
</tbody>
</table>

Procedures: Experimental Design

Procedures: Training Protocol

- **BTX-A plus voice therapy:**
  - 5 sessions – 1 session per week
  - Focus on voice education, relaxation, manual muscle tension reduction, easy voice onsets, continuity of breath flow
  - Daily home practice tasks

- **BTX-A plus sham voice therapy:**
  - 5 sessions – 1 session per week
  - Focus on nonspecific voice education, relaxation, active and passive oral motor tasks, sham manual muscle tension reduction, sustained phonation and speech carryover tasks
  - Daily home practice tasks

Compliance monitored via structured interview and practice logs

Participants discouraged from over- and under-practicing treatment tasks

Measures

- Treatment Effect Duration (weeks)
- Quality of Life (V-RQOL; Hogikyan & Sethuraman, 1999)
- Acoustic – Signal typing (Titze, 1994)
  - Workshop on Acoustic Voice Analysis Summary Statement
  - Qualitative means of describing voice signals based on presence of bifurcations, changes in vibratory behavior
Acoustic: Signal Typing

Type 1

Type 2

Type 3

Acoustic: Voice Breaks

Inappropriate (not at word or syllable boundaries) breaks in voicing

Acoustic Measures

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Calculation</th>
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<tbody>
<tr>
<td>%age Type 1 Signals</td>
<td>Duration Type 1 Signals / Voiced Segment Duration</td>
</tr>
<tr>
<td>%age Type 2 Signals</td>
<td>Duration Type 2 Signals / Voiced Segment Duration</td>
</tr>
<tr>
<td>%age Type 3 Signals</td>
<td>Duration Type 3 Signals / Voiced Segment Duration</td>
</tr>
<tr>
<td>%age Voice Breaks</td>
<td>Duration Voice Breaks / Voiced Segment Duration</td>
</tr>
<tr>
<td>%age Undesirable Signals</td>
<td>%age Type 2 + %age Type 3 + %age Voice Breaks</td>
</tr>
</tbody>
</table>

Separate measures were calculated for sustained phonation (/a/) and connected speech (Rainbow Passage)

Type 1 signals = "Desirable" signal
Type 2 + Type 3 + Voice breaks = "Undesirable" signals

Results: Statistical Method

- General
  - Summary stats to identify outliers, check for missing values, etc.
  - Within group comparisons to measure effect across time
  - Numerical data compared through Kruskal – Wallis tests
- Inter- and intra-rater reliability - ICC
- Trend Analysis:
  - Survival Analysis of Treatment Effect Duration – LIFETEST procedure (SAS). All Variable...evaluate trends over time

Results: Treatment Effect Duration Measure

7.14 – 41.14 weeks (Mean = 20.03 SD = 8.25)

No significant Differences among groups

Results: Change in V-RQOL After BTX but before Therapy

<table>
<thead>
<tr>
<th>Standard score</th>
<th>% change after injection</th>
<th>p-value</th>
</tr>
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<tbody>
<tr>
<td>Social-emotional</td>
<td>Median 73.21</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Physical</td>
<td>Median 90.91</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Total</td>
<td>Median 83.33</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

Statistically significant improvements in V-RQOL scores were observed, for all participants, following injection.
Results: Change in V-RQOL Across Groups and Over Time

Longitudinal Analysis: Therapy made no significant differences in sustained improvement in QOL

BTX only  BTX + voice therapy  BTX plus sham therapy

Results: Change in V-RQOL Across Groups and Over Time

- Change in V-RQOL standard score of 25 – 30 points “clinically significant.” (Rubin et al., 2004)
- Descriptive Trends: “Clinically Significant” Improvement
  - BTX only → 82% achieved this goal
  - BTX + voice therapy → 100% achieved this goal
  - BTX + sham therapy → 90% achieved this goal

Results: Change in Type 1 “Desirable” Signals Across Groups and Over Time

During sustained phonation:
- No differences among groups
During connected speech:
- BTX + voice therapy > BTX + sham therapy

BUT . . .

Results: Change in Type 2, 3, and Voice Break “Undesirable” Signals Across Groups and Over Time

During sustained phonation: No differences among groups
During connected speech:
- BTX + voice therapy had a greater decrease in undesirable BUT yet Botox created the same effect

Discussion: Treatment Effect Duration Measure

- BTX-A only group → 14.9 weeks (W & M)
- BTX-A plus voice therapy group → 27.4 weeks (W & M)
- BTX-A only group → 22.19 weeks (W & M)
- BTX-A plus sham therapy group → 20.91 weeks
- BTX-A plus voice therapy group → 17.25 weeks
  - Constraints of clinic scheduling
  - Some participants opted for no reinjection
  - Could † focus on voicing result in † inter-injection intervals for participants in BTX + voice therapy and BTX + sham therapy groups?
Quality of Life Measure

- All groups with similar increases, then decreases in V-RQOL...lost effect over time
- All groups improved with clinical significance following BTX
- Data trends suggest involvement in therapy may enhance patient perceptions of quality of life

Acoustic Measures

- Mixed results (BTX + voice therapy > BTX + sham therapy but no differences compared with BTX only)
- Symptoms more evident during connected speech
  - Signal prevalence: Type 3 > Type 2 > Voice breaks

Ongoing Research

- Type 3 part of disease and part of therapy outcome
- Further work needed to discover acoustic transition of voice across a continuum
  - Jitter, shimmer – isolated events
  - Need to describe voice normalization process
- Signal typing and relationship to perceptual measures of symptom severity
  - Appears strongly correlated in connected speech
- Continued focus on treatment efficacy