MUSCLE TENSION DYSPHONIA – THERAPY OUTCOMES USING COMPREHENSIVE VOICE ANALYSIS

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Introduction: Vocal hyperfunction is characterized by excessive effort to speak, apparently visible in the extrinsic, intrinsic muscles and also in muscles around peri-laryngeal areas. Voice problems arising from excessive muscular effort are frequently referred to as “Muscle Tension Dysphonia (MTD)”. Based on visual analysis of the structures, according to Morrison and Rammage (1993) MTD can be classified as Grade I, II (a & b) and III. Grade I MTD exhibits a large posterior chink showing isometric laryngeal constriction. Grade II (a) show lateral contraction with no glottic chink, and Grade II (b) with supraglottic lateral contraction showing supraglottic diamond shaped chink. Grade III MTD show an antero-posterior supraglottic constriction. Etiologically, MTD is classified as primary (symptoms due to vocal misuse or psychological factors), and secondary MTD (secondary to another voice disorder, Eg: compensated unilateral vocal cord paralysis, Vocal nodule, Reflux laryngitis,etc.). Laryngeal manual therapy (LMT), Manual circumlaryngeal massage therapy (MCT,) etc are techniques that are applied on patients with MTD. The working hypothesis is that when muscle tension of the phonatory mechanism reduces, the vertical position of the larynx lowers and improves the voice quality. These techniques reduce the muscle tension and hyperfunctional voice use but do not restore the balance between the
systems involved in voice production. So, the treatment protocol for MTD should involve techniques that reduce muscle tension, changes due to hyperfunctional voice use and restore balance of the subsystems involved in phonation (Breathing, laryngeal & supra laryngeal systems).

Need:
The therapy techniques for MTD are focused on reducing the musculoskeletal tension and vocal hyperfunction. There is an inherent need for a treatment protocol which also enhances the subsystem coordination for speaking.

Aim: This study aimed at documenting evidence for the proposed treatment protocol for the management of MTD using a comprehensive voice analysis.

Materials and Methods:
Subjects: 5 male subjects (Age range: 23 to 51 years; Mean: 41.6 years & SD: 9.15) diagnosed with MTD (Primary & Secondary) by ENT surgeon and SLP on stroboscopic examination participated in the study.
Procedure: Pre treatment: All subjects underwent a pre treatment voice analysis: videostroboscopic assessment (glottic closure, mucosal wave, amplitude of vocal cord vibration) using ATMOS Media strobe; GRBAS (Perceptual evaluation); Maximum Phonation Time; Fundamental frequency (F₀) and Dysphonia Severity Index (DSI) using Ling Waves; and self-evaluation (Voice Disorder Outcome Profile [V-DOP]).
Treatment protocol: The subjects underwent speech therapy for 8-12 weeks (weekly twice; each consisting of ½ hour session, repeated & practiced twice everyday) by the same clinician. The treatment protocol included advises on vocal hygiene, instructions for breathing exercises and relaxation in order to normalize muscle tension and enhance ‘coordinated phonation’, laryngeal massage, kneading and stretching of peri-laryngeal musculature to reduce musculoskeletal tension associated with hyperfunction, and vocal function exercises with frontal focus to restore balance to the subsystems. Steps were progressed based on subjective impressions of tension around the peri-laryngeal area, changes in voice quality and self reports of the subjects. Laryngeal massage and breathing exercises were initiated simultaneously for the first 4 weeks, where no focus was given to voicing. Once the laryngeal tension reduced, breathy voicing was initiated and massage was continued. Last 4-6 weeks focused on vocal function exercises and, generalizing to speaking level.
Post treatment: All subjects underwent the comprehensive voice analysis on their last session of therapy.
Statistical analysis: ANOVA (repeated measure of analysis of variance) was used to evaluate the changes after treatment.

Results:
Pre treatment: Stroboscopic assessment revealed Grade II MTD in 3 subjects and Grade III MTD in the other 2 subjects. All subjects showed hyperadduction of ventricular bands, asymmetrical vocal fold vibration and supraglottic constriction (Antero posterior & lateral) during phonation. Perceptual assessment of overall grade and strain revealed severe deviation in all subjects. Maximum phonation time was found to be between 8.2 -
15.7 seconds (mean: 11 sec, SD: 2.76). The fundamental frequency ($F_0$) of the subjects was found to be high (mean: 248 Hz; SD: 60.9). Dysphonia Severity Index (DSI) revealed moderate to severe deviation in voice ranging from -2.22 to -0.13 (Mean: -1.02; SD: 0.82). The subjective self persect V-DOP revealed an average severity score 9.08 out of 10 (Range: 7.8 to 10; SD: 1.06) indicating that subjects perceived severe voice problems.

**Post treatment:** Stroboscopic findings revealed reduction in laryngeal hyperfunction in all subjects. Of the two grade II MTD subjects, one showed normal study and the other was Grade I MTD with less hyper adduction, and longitudinal closure. The three other subjects were at Grade II MTD. All subjects demonstrated hard glottal attack during the initiation of phonation (including person with normal study). In perceptual evaluation, the overall grade and strain revealed normal to moderate deviation indicating the improvement in the voice quality. The maximum phonation time ranged from 10.4 to 20 seconds (Mean: 17 sec; SD: 5.6) and a statistically significant increase ($p<0.05$) was observed in post treatment analysis. The mean and SD of fundamental frequency ($F_0$) was 125.8 Hz and 10.6 respectively, which was a significant ($p<0.05$) decrease following treatment. Post treatment, the DSI ranged between -0.85 to 2.6 (mean: 0.06; SD: 1.26). Statistically significant difference ($p<0.05$) in post treatment indicated that the severity of the dysphonia was reduced. V-DOP score ranged between 0 - 5 (mean: 2.4; SD: 1.8) and a significant decrease ($p<0.01$) was observed in post treatment analysis.

**Discussion:** Though most parameters showed changes and some were well within expected range after therapy, use of stroboscopy helped identify and illustrate to the patient the reduction in laryngeal tension and existence of tendencies for hyperfunctional behaviors (persistence of glottal attacks) after therapy. There were subjective variations (such as motivation, compliance, etc) that played important role in the treatment and are not addressed in this paper.

**Conclusion:** The findings revealed that there was a positive effect of the treatment protocol on subject’s vocal behavior and output. These encourage use of comprehensive voice analysis and inclusion of the patient in the diagnostic-therapeutic decision makings. It would be interesting to study the period of sustenance of therapy effect and factors leading to relapse after therapy.