IMPACT OF BALLOON DILATION ON VOICE QUALITY IN LARYNGOTRACHEAL STENOSIS: A PROSPECTIVE STUDY


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ABSTRACT

Aim
To prospectively study changes in voice in adult patients with subglottic stenosis (SGS) undergoing balloon dilation.

Material and Methods
Voice-related quality-of-life (V-RQOL), Dyspnea index (DI), acoustic and aerodynamic analysis, and Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) were compared pre- and post-operatively in SGS patients who underwent balloon dilation.

Results
10 patients completed pre- and post-operative measures at this time. Average V-RQOL increased from 75.6 to 86.9 (NS). Average DI decreased from 27 to 8 (p<0.0001). CAPE-V overall severity scores decreased from 30.2 to 21.8 (NS). Aerodynamic measures improved for expiratory volume (2.30 to 3.04, p<0.05), phonation time (9.97 to 11.32, NS), mean expiratory airflow (156 to 161, NS), aerodynamic resistance (110 to 59, NS), and peak air pressure (9.05 to 8.83, NS). Acoustic parameters did not change.

Conclusion
Following dilation, patients with SGS demonstrated improvement in breathing quality of life, subjective and perceptual assessment of voice, and aerodynamic measures with no improvement in acoustic measures. The trend toward improvement in V-RQOL may relate to better breath support and/or better vocal mechanics with more laminar airflow through the subglottis reducing turbulence through the vocal fold.

INTRODUCTION

There is more literature on airway outcomes than voice outcomes for surgical treatment of laryngotracheal stenosis (LTS). Patients with subglottic stenosis who were scheduled to undergo cryo-destruction, excision, balloon dilation, and steroid injection of subglottic/tracheal stenosis between September 2013 and July 2014 had pre- and post-operative acoustic and aerodynamic analysis, and completed Voice-related quality-of-life (V-RQOL), Dyspnea index (DI), acoustic and aerodynamic measures were captured pre- and post-operatively. Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) scoring was performed for each recording. Pre- and post-operative scores were compared using paired t-test. P < 0.05 was considered significant.

RESULTS

Table 1: Pre- and post-operative V-RQOL, CAPE-V, CCQ, DI and aerodynamic measures. Significant results highlighted.

DISCUSSION

Voice Outcomes: V-RQOL improvement occurred after dilation in 9 of 10 patients with mean V-RQOL increasing from 75.6 to 86.9. Given the lack of change in perceptual voice by trained professionals and in acoustic parameters, the trend toward subjective improvement of voice may be attributed to patient perception of improved speech fluidity and breathing coordination after dilation.

Dyspnea Outcomes: Both dyspnea quality of life scales demonstrated significant improvement after dilation. CCQ improved 2.1 while DI improved 21.4. These results support the use of dyspnea quality of life scales in LTS patients.

Aerodynamic Measures: Expiratory volume significantly increased (p<0.042) after balloon dilation, while laryngeal resistance trended toward significance (p<0.06). The increased cross sectional area after dilation at the level of stenosis likely explains the increased expiratory volume. While the resistance measured in this study is across the glottis, it suggests that the importance of resistance as an objective measure for LTS and to help determine the need for intervention. Wasserman et al. placed post stenotic pressure sensor via bronchoscopy to measure resistance across the stenosis. Their results suggested inspiratory resistance to be the key measure indicating the need for surgical treatment.

CONCLUSIONS

1) LTS patients demonstrate a trend toward improvement in voice quality of life following balloon dilation.
2) Dyspnea quality of life measures (CCQ and DI) significantly improve following dilation.
3) Expiratory volumes significantly increase while glottic resistance decreases following dilation.

REFERENCES