

**Background:** Gender incongruence occurs when there is a discrepancy between gender identity and a person's sex assigned at birth and their bodily appearance. Transwomen (transsexual individuals who are assigned male sex at birth) often want to feminize their voices to be perceived as women by others. Voice therapy, including exercises to increase fundamental frequency (F0), is essential. Some individuals also need pitch-raising surgery to further raise or maintain pitch or to abolish voice production in the lowest frequency range. Cricothyroid approximation (CTA) and anterior vocal fold shortening by Glottoplasty (GP) are common surgery techniques. The purpose was to investigate results after voice therapy and long-term effects of pitch-raising surgery.

**Methods:** Acoustic voice data and patient reported outcome measures were analyzed from 22 transwomen, 35-67 years. All had had the diagnosis transsexualism confirmed by the psychiatric team prior to voice assessments and intervention. All had received voice therapy prior to surgery according to the treatment program in Sweden<sup>1</sup>. Ten underwent CTA, ten GP (30% of membranous portion), and two both types of surgery. Voice recordings were made before and after voice therapy, one month after surgery, and at least 12 months after surgery. The recordings were carried out in a sound-treated booth, according to standard procedures<sup>1</sup>. Acoustic measurements of F0 and Sound Pressure Level (SPL) were extracted from speech range profiles (SRP) and voice range profiles (VRP). The patients answered a questionnaire about their voices and treatment outcomes.

**Results:** Mean F0 increased significantly from 129 Hz (SD 23) before to 152 Hz (SD 26) after voice therapy ( $p < .001$ ), which was not enough according to patient evaluations. Mean F0 increased significantly to 171 Hz (SD 30) after surgery and decreased to 166 (SD 23) Hz after one year, however the decrease was not statistically significant. Minimum F0 in the VRP increased significantly from 84 Hz (SD 13) preoperatively to 107 Hz (SD 25) at follow-up ( $p < 0.001$ ) and was higher after CTA (120 Hz, SD 16) than after GP (92 Hz, SD 20). Two thirds of the patients were satisfied with their voices after surgery. A third reported negative effects such as hoarseness, difficulties to raise voice intensity, decreased pitch range, and a need to clear the throat.

**Conclusions:** Feminizing voice therapy significantly increases mean F0, however, for the group in this study, to a gender neutral frequency range. Mean F0 increase significantly after pitch-raising surgery with some decrease over time, although not to preoperative levels. CTA is a more effective method than 30% GP for a permanent increase of the lowest frequencies

in the physiological frequency range. Since symptoms such as hoarseness, difficulties to raise voice intensity, decreased pitch range, and a constant need to clear the throat was reported by 1/3 of the patients, postoperative voice therapy is recommended to reduce voice symptoms and optimize a female voice.

**Key words:** vocal folds, transsexual male-to-female, phonetogram, voice

1. Södersten M, Nygren U, Hertegård S, Dhejne C. Interdisciplinary program in Sweden related to transgender voice. *Perspectives on voice and voice disorders* 2015, Vol 25, Issue 2. July Vol. 25, 87-97. doi:10.1044/vvd25.2.87