

## To Web or Not to Web

### ABSTRACT

Anterior glottic webs (anterior fusion of the vocal folds) are not very common lesions seen by laryngologists and ENT surgeons. Depending on the extent of this fusion, symptoms may range from stridor to dyspnea on exertion to hoarseness of voice. Treatment options include endoscopic and open approaches. Although generally an anterior glottic web is an undesirable entity, there are special circumstances when an intentional creation of a web is planned to increase the pitch of voice as part of voice feminization surgery. We discuss three cases of anterior glottic web, each representing an example of these webs as a boon or a bane.

**Key words:** Anterior glottic webs, Glottic healing, Voice feminization surgery, Wendler's glottoplasty

### INTRODUCTION

The human vocal folds form a V-shape anteriorly called the anterior commissure. Occurrence of webbing at this V-shaped anterior commissure is referred to as anterior glottic web (AGW). Anterior glottic webs may be congenital or acquired lesions with the congenital webs seen infrequently in comparison to acquired AGW. AGW often presents with dysphonia and/or breathing difficulty and usually forms secondary to laryngeal trauma or previous laryngeal surgery. They can also occur following radiotherapy or endotracheal intubation.<sup>[1]</sup>

AGW ranges in size from small microwebs, to larger webs extending through the entire length of the membranous vocal folds. They are evaluated in two planes: Anteroposterior and superior-inferior plane. Depending on the length and depth of these webs, the symptoms of patients may range from hoarseness of voice to compromise of the airway tract and difficulty in breathing. However, there is a situation when these webs can serve as a boon to certain patients. They are intentionally created to increase the pitch of the voice, which helps patients who have undergone gender transformation from male to female. In 1990, Wendler first described the glottoplasty surgery in which an anterior glottic web is created to shorten the length of vibrating vocal folds and raise pitch of voice.<sup>[2]</sup> Vocal pitch is the critical differentiating feature for male and female voices. Females tend to have a higher fundamental frequency as compared to men. The average fundamental frequency during conversation for males ranges from 100 to 150 Hz, whereas for females, it ranges from 180 to 250 Hz. In the modern society, with increasing acceptance of trans-genders, Wendler's glottoplasty is becoming a popular surgery. We present three cases which highlight the role of the AGW as a boon or a bane for the patient.

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### Case 1

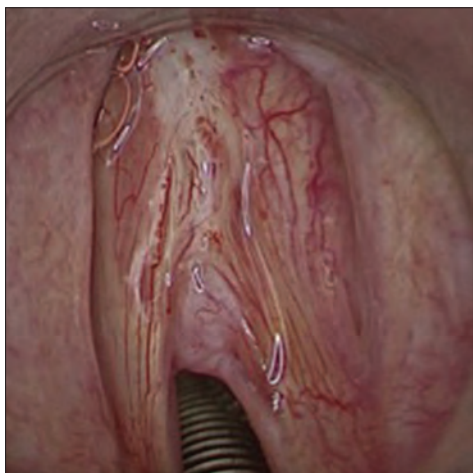
A 47-year-old gentleman (patient X), teacher by profession and a hobby singer, came with complaints of hoarseness of voice and vocal fatigue for 8 months. Video laryngostroboscopy revealed a Cohen's type 2 AGW with a small spherical mass at the posterior end of this web [Figure 1].

The patient underwent microlaryngoscopy (MLS) under general anesthesia and laser excision of the posterior spherical mass which on histopathology was non-granulomatous and not malignant. To improve the patient's voice, the anterior glottic web was excised, using the CO<sub>2</sub> laser, at the presumed right vocal fold medial edge, thus preserving the tissue composing the web. The undersurface of this web tissue was freshened and used to cover the left vocal fold as an epithelial cover in order to minimize web recurrence [Figure 2]. Although following vocal fold surgery, post-operative voice rest is usually recommended, in this particular instance, voice rest may actually promote rewebbing and is to be avoided. Postoperatively, the patient's voice is improved and his strob findings showed good healing.

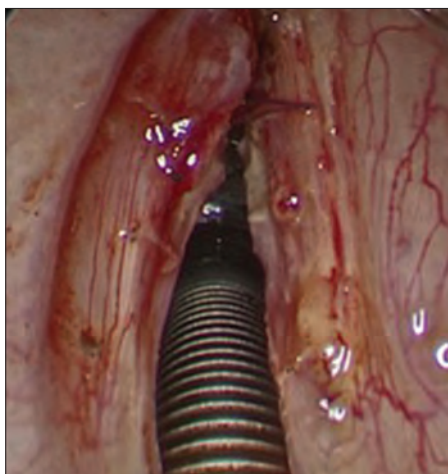
### Case 2

A 56-year-old gentleman (patient Y) came with complaints of hoarseness of voice for 2 months and he was found to have

right vocal fold leukoplakia growth with the presence of a small AGW [Figure 3]. MLS with frozen sectioning revealed laryngeal cancer for which he underwent a Type 6 CO<sub>2</sub> laser cordectomy.<sup>[3]</sup> Although histopathology confirmed free vocal fold margins, post-operative stroboscopy [Figure 4] a month later revealed a suspicious leukoplakia at the anterior commissure for which a check MLS was performed. The histopathology report confirmed an absence of malignancy, and postoperatively, the patient was given routine antacids and anti-inflammatory medications. Despite two surgeries at the anterior commissure, the subsequent follow-ups showed excellent healing of the vocal folds with no signs of any AGW formation [Figure 5]. This is very unusual following two surgeries at the anterior commissure and indicates that post-operative healing is multifactorial and highly individualized.



**Figure 1:** Web seen over anterior glottic region pre-operatively in patient X



**Figure 2:** Post-operative image after excising the anterior glottic web and suturing the epithelial microflap covering the left vocal fold in patient X

### Case 3

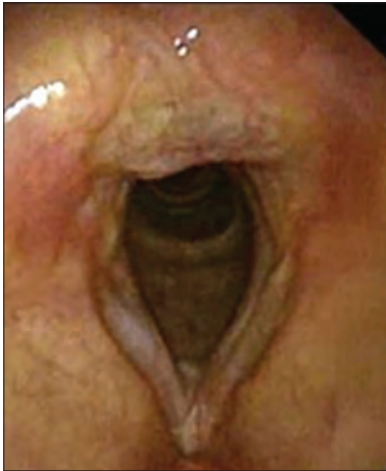
While the previous two cases were situations where the AGW contributed toward symptoms of dysphonia for the patient, case 3 is a situation wherein an AGW was surgically created intentionally. A 28-year-old trans-gender lady (patient Z) came to us with an anatomically normal larynx [Figure 6], requesting a permanent solution to her masculine voice. Despite voice therapy, the masculine voice reappeared unintentionally when she attempted to express emotions such as crying or laughing. We performed a Wendler's glottoplasty (AGW creation) under general anesthesia. The creation of an AGW increases the pitch of the voice since the length of the vibrating vocal fold is inversely proportional to the pitch. The medial edge of the anterior half of the vocal folds was deepithelized, using the CO<sub>2</sub> laser and sutured to each other using 4-0 Vicryl in three sutures [Figure 7].



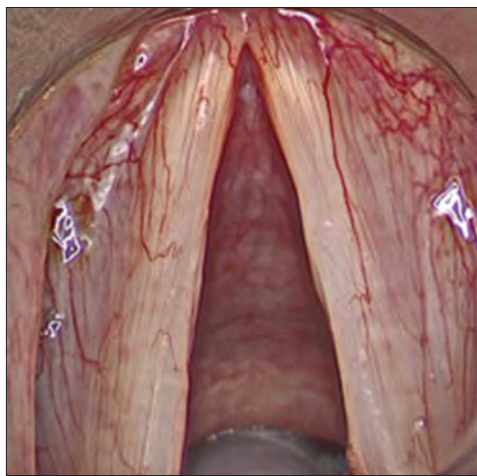
**Figure 3:** Right vocal and anterior commissure vocal fold carcinoma with an anterior glottic web in patient Y



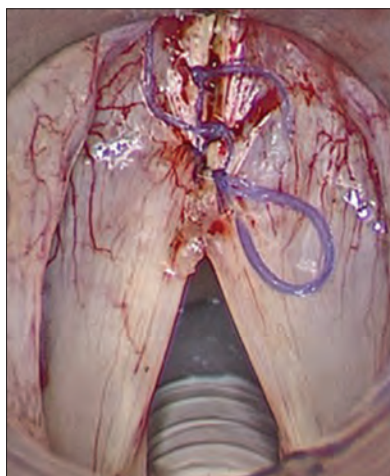
**Figure 4:** Right VF small healing granuloma 2 months postoperatively with an anterior commissure suspicious growth in patient Y



**Figure 5:** Final Post-operative healing of vocal folds 1 year after the primary surgery without any anterior webbing in patient Y



**Figure 6:** Pre-operative image of healthy vocal folds in patient Z



**Figure 7:** Creation of an anterior glottic web (Wendler's Glottoplasty) to shorten the length of the membranous vibrating vocal folds in patient Z who had previously undergone a male to female gender reassignment surgery

Postoperatively, voice rest for 10–14 days is advised to prevent dehiscence of the sutures by tension caused by the vocal fold movements. On subsequent follow-up, a well-healed anterior glottic web had formed and the pitch of her voice had dramatically increased from 147 Hz to 194 Hz. Voice modulation and intonation were enhanced by voice therapy exercises 3–4 weeks postoperatively.

## DISCUSSION

Each of the three cases that we have presented above has a unique characteristic of note.

In the first case, the AGW caused hoarseness of voice in the patient without any breathing difficulty. Our primary aim was to excise the AGW to improve the voice of the patient as well as confirm on histopathology that this was a benign lesion with no potential malignant threat. Once an asymmetric incision of the anterior glottic web at one free edge of the vocal fold is taken, it can then be incorporated to form a flap. This mucosal flap, when draped into the infraglottic surface of the vocal fold and sutured in place, provides good healing and prevents recurrence. One can also perform a release of the anterior glottic web with endoscopic keel placement.<sup>[1]</sup>

The next case was that of a malignancy extending to the anterior commissure with a small AGW, which was surgically resected with free margins. Despite two wide surgeries at the anterior commissure aimed at cancer free margins, the patient healed unexpectedly well and without any recurrent web. In the post-operative period, release of biomolecules known as Damage-Associated Molecule Patterns (DAMPs) activate pro-inflammatory and anti-inflammatory responses which are designed to defend and contain inflammatory responses locally.<sup>[4]</sup> Proper balance of these DAMPs helps in regulating the immune response of the body. Hence, if the body can maintain the balance between DAMPs biomolecules, it may be possible to help reduce the scarring and keep the post-operative inflammation to minimum. Therefore, we can deduce that the patient's innate immunity has helped in healing in the post-operative period. This is an example wherein we understand that the sequelae of such an extensive surgery largely depend on individual healing abilities and cannot be perfectly predicted beforehand. Biomarkers such as procalcitonin (PCT) and C-reactive protein (CRP) have thus emerged as attractive contenders to map the immune response.<sup>[4]</sup>

The third case is an example of utilizing physiological principles to achieve and increase in pitch of voice useful for feminization of voice in male-to-female transsexualism. The principle of this procedure (Wendler's glottoplasty) is based on the fact that length is inversely proportional to pitch. Therefore, by creating an anterior glottic web in these patients, the vocal folds shorten and the pitch increases and the voice becomes more high pitched and feminine. The transgender patient cosmetically prefers an endoscopic surgery such as Wendler's glottoplasty as it does not leave a neck scar.<sup>[5]</sup> We have observed a remarkable boost in the personality and confidence of trans-genders simply by transforming their voice.

## CONCLUSION

It is fascinating to note how the same “pathological” lesion can be both detrimental and beneficial to one’s voice depending on the circumstances. Tailoring the management and surgical plan to suit each individual is of paramount importance. Shakespeare<sup>[6]</sup> famous lines are “to be, or not to be, that is the question” and sometimes laryngology too poses itself with the ironic question “to web or not to web?”

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