Patient Satisfaction after Aesthetic Chondrolaryngoplasty

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Background: Patient’s pursuing aesthetic surgery often inquire about the success of the procedure. Having objective data for these patients improves preoperative counseling. To assess patient satisfaction after aesthetic chondrolaryngoplasty using specifically developed outcomes assessment instrument and to evaluate the anatomy of the vocalis insertion on the thyroid cartilage and its effect on the extent of surgical resection.

Methods: Retrospective survey of patients who underwent chondrolaryngoplasty from 2006 to 2012. Patients answered 6 questions on a 5-point Likert scale assessing satisfaction from a physical, emotional, and social quality of life perspective. We separately undertook cadaveric dissection to examine the ligamentous attachment of the vocal fold to the thyroid cartilage.

All patient were seen in a private practice affiliated with a university medical center.

One hundred ninety-eight patients underwent chondrolaryngoplasty during the study period; we were able to contact 112.

The main outcome measure is patient satisfaction using a 5-point Likert Scale.

Results: Sixty percentage of patients were either “very” or “completely” satisfied with the appearance of their neck and Adam’s apple. Only 13% still reported that their neck/Adam’s apple still appeared unsatisfactorily prominent or masculine. No patients had permanent voice change, and greater than 90% of patients had no significant voice change of any duration; any voice change was temporary. The most frequent comments from less satisfied patients were the amount of remaining prominence and the size or location of the scar.

Conclusions: Aesthetic chondrolaryngoplasty is a safe and effective surgery to reduce the prominence of the thyroid cartilage. Patients should be aware that because of the need to preserve voice it may not be 100% effective from an aesthetic perspective. (Plast Reconstr Surg Glob Open 2018;6:e1877; doi: 10.1097/GOX.0000000000001877; Published online 3 October 2018.)

BACKGROUND

Chondrolaryngoplasty, or “tracheal shaving,” is a cosmetic procedure designed to reduce the prominence of the thyroid cartilage. It was initially described by Woffort and Parry1 in 1975, and further modifications to the original technique were described by Woffort et al.2 in 1990. Although at our institution it is primarily performed for transgendered women (male to female) for whom the prominent “Adam’s apple” is a marker of masculine appearance, this is not exclusive, and tracheal shaves have been performed on both natal men and women who desire reduction of a prominent “Adam’s apple” for aesthetic purposes.

Upon reaching puberty, the male larynx, and particularly the thyroid cartilage, increases in size. The anterior–posterior dimension of the larynx will nearly double in size, resulting in increased projection and prominence in the midline, and in males is much sharper than in females. The prominence of the larynx is most distinct superiorly, while the attachments of the laryngeal muscles, epiglottis,
and vocal folds are all more inferior. This allows for safe removal of the more prominent superior cartilage.\(^2\) Reduction of this prominence decreases the masculine appearance of the “Adam’s apple.” Although one would optimally remove all of the anteriorly projecting cartilage, the inferior extent of safe removal is dictated by the location of the insertion of the vocal folds. This is discussed further below. Destabilizing the anterior commissure tendon by overaggressive resection can significantly and irreversibly affect the patient’s voice. This is particularly devastating in transgendered females, in whom lowering the voice can be especially traumatic and a difficult handicap to overcome. As such, the aesthetic result must be balanced with the goal of minimizing the risk of overresection and voice change.\(^3\)

The technique described by Wolfort et al.\(^2\) involved endotracheal intubation, with elevation on the inside of the thyroid laminae inferiorly to the level of the thyroepiglottic ligament to prevent damage to the vocal folds. The vocal folds are then examined upon extubation. Spiegel’s modification to this, published in 2008,\(^3\) utilizes a laryngeal mask airway and fiberoptic laryngoscopy to allow visualization of the larynx during the procedure. A 22-gauge needle is placed through the laryngeal cartilage and used to mark the level of the anterior commissure, and the inferior extent of cartilage resection. The senior author has had great success with this technique and has performed greater than 200 chondrolaryngoplasties in this improved manner.

Outcomes research has become a buzzword over the last 20 years. Although generally speaking, any study assesses an outcome of some form, the term “outcomes research” is typically used for research that focuses on patient-centered or patient-reported outcomes; common measurements include quality of life, patient satisfaction, functional outcomes, and cost. As these studies have proliferated, the use of specifically designed questionnaires or surveys tailored to specific procedures has become the norm.\(^4,5\) The development of validated and patient-based assessment tools improves the ability to standardize reporting of outcomes. This is particularly beneficial in aesthetic surgery, whose outcomes are primarily subjective and in which patient satisfaction is often the most important outcome.

**PATIENTS AND METHODS**

The surgical records for the senior author (J.H.S.) from January 1, 2006, to December 31, 2012, were reviewed, and all patients who underwent chondrolaryngoplasty were initially included. Chart review for these patients was performed to obtain contact information. The patients were then contacted electronically and asked to complete a brief survey on their satisfaction with their surgical outcomes. Approval was obtained from the Institutional Review Board of the Boston Medical Center for this study.

An outcomes instrument was designed for aesthetic chondrolaryngoplasty based on the outcomes evaluation instruments designed and validated by Alsarraf et al.\(^6\) The instrument included questions designed to assess physical, emotional, and social quality of life. The instrument consisted of 7 questions (Fig. 1); 6 questions assessing patient outcome on a 5-point Likert scale from 0 to 4, and

1. Other than your trach shave, have you ever had surgery on your vocal cords or voice box?
   - [ ] Yes
   - [ ] No

Please respond with the number that best characterizes your current opinion regarding the following questions:

1. How well do you like the appearance of your neck and Adam’s Apple?
   - 0 Not at all
   - 1 Somewhat
   - 2 Moderately
   - 3 Very Much
   - 4 Completely

2. Do you feel your current neck/Adam’s Apple appearance limits your social or professional appearance?
   - 0 Not at all
   - 1 Somewhat
   - 2 Moderately
   - 3 Very Much
   - 4 Completely

3. Do you feel your current neck/Adam’s Apple appears overly prominent or masculine?
   - 0 Not at all
   - 1 Somewhat
   - 2 Moderately
   - 3 Very Much
   - 4 Completely

4. How confident are you that your neck/Adam’s Apple appearance is the best it can be?
   - 0 Not at all
   - 1 Somewhat
   - 2 Moderately
   - 3 Very Much
   - 4 Completely

5. Would you like to alter the surgical neck/Adam’s Apple?
   - 0 Not at all
   - 1 Somewhat
   - 2 Moderately
   - 3 Very Much
   - 4 Completely

6. Are you happy with the quality of your voice?
   - 0 Not at all
   - 1 Somewhat
   - 2 Moderately
   - 3 Very Much
   - 4 Completely

**Fig. 1.** Quality of life instrument for chondrolaryngoplasty.
a separate question asking if patients had ever had other surgery on their voice box or vocal cords other than chondrolaryngoplasty. Patients who answered this affirmatively were excluded from the study. This was the only exclusion criteria.

RESULTS

In total, 198 patients were initially identified who underwent chondrolaryngoplasty. Of these patients, we were able to contact 112 and provide them with a survey. The response rate was 22.7% (48/198). Three patients indicated that they had undergone surgery other than chondrolaryngoplasty on their vocal cords or voice box and were excluded. This left 45 patients, which is 23% of the total patients who underwent chondrolaryngoplasty during the study period.

Sixty percentage of the respondents (27/45) reported that they were either “very” or “completely” satisfied with the appearance of their neck and Adam’s apple, and only 13.3% (6/45) were “not at all” satisfied. Among those who were less satisfied, the most common complaints were the scar and the remaining size. Only 15% (7/45) of patients reported that their current neck/Adam’s apple appearance limited their social or professional appearance. The most common reasons cited again were the scar or the persistent prominence. Although only 55.5% (25/45) patients were either “very” or “completely” confident that their neck/Adam’s apple appearance is the best it could be only 25% (11/45) were interested in further surgically altering the appearance of their neck/Adam’s apple. Among those patients who were less satisfied but not interested in further surgery, the most common reasons cited were concern with worsening the scar or that they did not want to go through more surgery.

To the question of whether their neck/Adam’s apple still appeared overly prominent or masculine, 24.5% of patients (11/45) replied either “moderately,” “very,” or “completely.” Again, the most frequently reported comment was the persistent size of the thyroid cartilage. Importantly, patients are counseled before surgery that the extent of resection will be limited by the attachment positions of their vocal cords. The method of Spiegel permits maximum reduction in size of the cartilage while preserving vocal function.

Finally, only 4 out of 45 patients reported that their voice was either “somewhat” or “moderately” different than before the surgery, and no patients reported that it was “not at all” the same. Among those 4 patients, 1 reported that the change was temporary. The other 3 did not initially indicate the duration of change; however, in follow-up, no patients have reported any long-term voice changes.

ANATOMY

In the context of refining the tracheal shave technique in feminization procedures, we were interested in the specifics of the ligamentous attachments between the posterior wall of the thyroid cartilage and the anterior most aspect of the vocal cord at the anterior commissure. The anterior commissure is at risk of disruption during this procedure, resulting in permanent destabilization and subsequent hoarseness or respiratory distress. To date, there have been no long-term vocal ligament complications at this institution.

Additionally, the thyroepiglottic ligament must be considered during the tracheal shave because of its insertion site near the superior rim of the thyroid cartilage. Although epiglottic destabilization has not been reported at this institution, this is a known risk that can theoretically result in dysphagia.

Traditionally, the ligament was thought to extend from the vocal cord in a strictly posterior-to-anterior fashion with fibers remaining in the horizontal plane. Because of this, the amount of superior thyroid cartilage considered safe to remove was limited to the transverse level of the vocal cord. Inferior extension beyond this level would theoretically damage the anterior commissure attachment such that vocal cord function would suffer.

In light of intraoperative observations, we believe that the anterior commissure may actually extend radially in a cone-like projection from the vocal ligament to the thyroid cartilage. If this is the case, may be a level slightly inferior to the level of vocal cord where commissure fibers could be transected without causing vocal cord dysfunction. With crossing fibers still intact inferiorly, continued stability and vocal function would be retained while a more precise and desirable feminine appearance could be achieved and improve satisfaction rates. Additionally, the thyroepiglottic ligaments are not required for epiglottic stabilization, given the lack of reported postoperative complications despite near certainty of total ligament disruption. It is likely that scarring between this ligament and the anterior soft tissues of the neck are adequate for suspension.

Operative and fixed-tissue observations have subjectively confirmed the proposed anatomical arrangement of the anterior commissure—a radially extending configuration rather then a fixed linear plane. Our current methodology recommends against performing the incision inferior to a plane 0.5 mm above the vocal ligaments. These findings suggest that the incision could be made closer to the anterior commissure or even involve the superior-most aspect of the insertion.

Despite these findings, the severity and permanence of vocal cord destabilization and consequential hoarseness after an elective, aesthetic procedure poses too strong of a risk to attempt altering the maneuver at this time. Further analyses must be pursued in nonfixed tissue. Possibilities include studying the porcine larynx, its response to anterior commissure destabilization followed by tensile application on the vocal ligament and measurement of ligament integrity. If these observations hold true in nonfixed tissue, future modifications in the chondrolaryngoplasty procedure could provide a more favorable postoperative patient satisfaction rate.

With regard to the thyro-epiglottic ligament, through intraoperative observation, we have confirmed that the tracheal shave procedure does disrupt this attachment without reported postoperative dysphagia or aspiration.
This confirms the notion that this ligament is not necessary for proper epiglottis function.

**DISCUSSION**

Aesthetic chondrolaryngoplasty is a safe and effective procedure to reduce the prominence of the thyroid cartilage.\(^3\) Although at our institution it is performed most frequently in transgendered (male-to-female) individuals, it has also been performed in natal men and women for aesthetic reasons. The procedure represents a challenge for the facial plastic surgeon to balance aesthetic and function; conservative resection of the cartilage may leave the patient feeling dissatisfied with the result and frustrated with the surgeon, while overresection can destabilize the anterior commissure tendon and alter the register of the patient’s voice, which can be emotionally distressing, particularly in female and transgendered patients. It is important for surgeons to explain this to patients preoperatively so proper expectations can be set, but it is equally important for surgeons to be aware of how patients perceive their results postoperatively to modify their technique and better counsel patients before surgery. Although the surgeon may be satisfied with the postoperative outcome, the patient’s satisfaction is what will determine whether the operation is truly a success or a failure in achieving the desired outcome.

Overall, our patients were very satisfied with the results of this procedure. More than 50% of patients reported their neck/Adam’s apple appeared “not at all” prominent or masculine, and only 15% reported it was still “very” or “completely” prominent or masculine. Many of the 30% in the middle were satisfied with their results, but still reported a small notable prominence, though in some cases admittedly only noticeable to them, and not a hindrance. Equally important to our aesthetic outcomes, no patients reported a permanent change in voice, and greater than 90% noted no change at all.

The major limitation of this study is that it is purely retrospective. As such, we have no data on patient’s preoperative level of satisfaction with their appearance, although we can assume since they sought out elective cosmetic surgery they were not satisfied with their appearance. Additionally, since this is an anonymous retrospective survey, there is nonresponse bias. Obviously, there is concern that patients who are less satisfied with their results are more likely to complete the survey than those who were satisfied.

**CONCLUSIONS**

The results of this survey will allow us to better counsel our perspective patients. We can tell them that three-quarters of patients have adequate reduction in the size of the thyroid cartilage, and that the majority are very satisfied with their outcome. As we might expect persistent prominence of the Adam’s apple is the most common complaint after surgery, with scar appearance the second most commented complaint. We counsel patients that although we make our best efforts to hide the scar in the crease of the cervicomental angle, in some the healing is such that they may have a more noticeable scar or their obtuse cervicomental angle prevents adequate camouflage of the location.

Patient-centered outcomes are increasingly a focus of assessment in addition to traditional objective outcome assessments. Examples include functional outcomes, cost, patient quality of life, and patient satisfaction. This is especially important in aesthetic surgery, where outcomes are by definition subjective and patient satisfaction is the main outcome the surgeon strives for, while still performing medically appropriate procedures. Creating outcome evaluation instruments allows the surgeon to quantify the subjective, which allows for both self-assessment and improved preoperative counseling.

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