CRICOTHYROID APPROXIMATION USING A SILASTIC SHEATH: A NEW APPROACH

ABDUL-LATIF HAMDAN*

Abstract

Transsexualism is a gender identity disorder in which affected individuals believe themselves to be born into the wrong sex. Hormonal therapy and many surgical interventions were adopted in order to change their appearances. Cricothyroid approximation is the most acceptable surgical intervention to raise the vocal pitch in male to female transsexuals. Long term follow up of this surgery revealed some failure partially due to cutting of the sutures through the cricoid and thyroid cartilages. In this report we would like to describe the first case of cricothyroid approximation using a silastic sheath interposed between the cartilages and the mattress suture to circumvent such a complication.

Introduction

Transsexualism is a gender identity disorder in which affected individuals believe themselves to be born into the wrong sex. The prevalence is increasing and is estimated at 1 in 37,000 with the majority being male to female transsexuals[1]. It is thought to be a complex and permanent transposition, the causes of which are not known. The presence of a large nucleus suprachiasmaticus in the hypothalamus is recently being investigated as an organic etiological factor in transsexuality[2,3]. Hormonal therapy and many surgical interventions were adopted in order to change their appearances. The use of female hormones leads to larger breasts and a smoother skin. Surgical procedures include genital conversion in addition to mandibular angle contouring and breast augmentation. It is well known that the larynx is a hormonal target and hormonal receptors have been described in the vocal folds. The use of male hormones results in an irreversible deepening of the female voice, however, in male to female transsexuals, the voice and the laryngeal framework are not affected by estrogen treatment[4]. Consequently there is persistence of the masculine voice and the prominence of Adam's apple in these patients. Speech therapy to achieve a perceived feminine voice often results in a functional increase in pitch that is not always controllable by the patient. This is more pronounced in situations when primal unconditioned sounds prevail. This has lead to the emergence of new functional laryngeal procedures such as thyroplasty type IV or cricothyroid approximation, which was initially described by Ishhiki et al in an attempt to bring the thyroid and cricoid cartilages together[5-8]. The rationale behind such surgery is to increase the tension in the vocal folds without damaging the rima glottides. Despite the popularity of this procedure, there is growing evidence of long term failure to maintain the elevated pitch in these patients. In a study by Matai et al on 45 patients who had cricothyroid approximation, 79% thought their voice improved, 55% attributed the improvement to surgery and 21% to speech therapy[9]. The decrease in the efficacy of this surgery is not very well understood. Ishhiki et al has reported a possible

* **Corresponding Author:** Abdul-latif Hamdan, MD, EMBA, MPH, FACS, Department of Otolaryngology-Head & Neck Surgery, American University of Beirut Medical Center, Beirut, Lebanon. Email: ah77@aub.edu.lb

natural decrease in tension within the vocal folds with time[10]. In some cases, the failure has been attributed to the mattress sutures cutting through the cricoid and thyroid cartilages prior to the maturation of the scar in this region. This has been counteracted by using miniplates made of titanium or Lactosorb to avoid such complications [11]. In this report we would like to describe the first case of cricothyroid approximation using a silastic sheath interposed between the cartilages and the mattress suture.

Case Presentation

A 29 year old male to female transsexual presented to us with discontent of her male voice. Speech therapy did not provide a satisfactory outcome. Patient had genital conversion surgery, breast augmentation and has been on estrogen therapy. Medical history and system inquiry were negative. Patient was a heavy smoker and had no history of voice abuse or overuse. Laryngeal video-endostroboscopy was normal. Patient was informed about the surgical procedure and was admitted for cricothyroid approximation. Post-operatively there was a noticeable improvement in her voice and the patient was referred to a speech therapist for vocal training. One year follow up revealed further improvement in her vocal pitch.

Surgical Procedure

Under local anesthesia and with the patient fully awake, the neck was scrubbed and draped in the usual manner. A 5 cm transverse incision was made through the skin and subcutaneous tissues at the level of the cricothyroid membrane after infiltrating the skin with Xylocaine 1/100,000 epinephrine. Skin flaps were raised superiorly and inferiorly and strap muscles were reflected laterally. The cricothyroid muscles were identified (Fig. 1). Two 5 × 10 mm silastic sheaths were cut and positioned on both thyroid laminate and another two were placed on the cricoid cartilage. Non absorbable 3-0 Nylon mattress sutures were placed initially through the silastic sheath, then through the thyroid cartilage and were tunneled inferiorly and submucosally across the cricothyroid membrane into the cricoid cartilage and through the silastic sheath. The needle was then curved upward in the reverse direction from the silastic sheath, cricoid cartilage, tunneled upward through the cricothyroid membrane to exit from the thyroid cartilage and the overlying silastic sheath. Same procedure was done on the opposite side and the threads were tied in order to approximate the cricoid to the thyroid cartilage (Fig. 2). This was done while the patient is phonating in order to better tune her voice.

Fig. 1
A transverse skin incision showing the cricoid, thyroid and cricothyroid muscle

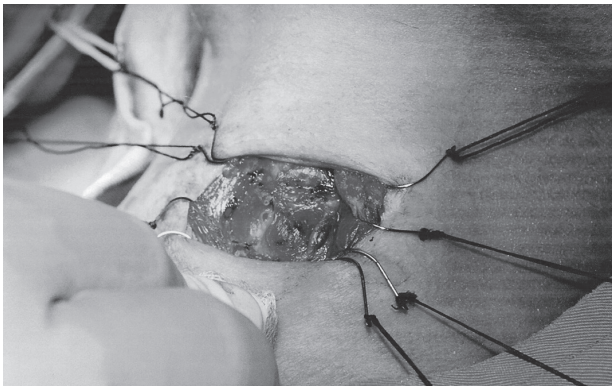
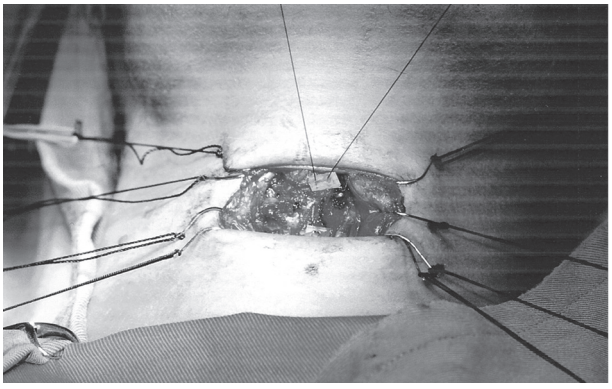


Fig. 2
Two 5 × 10 mm silastic sheaths positioned on the left thyroid lamina and cricoid cartilage with a mattress suture running across



Discussion

The history of surgical management of the transsexual voice has evolved over the last two decades. The aim of the surgery is to increase the fundamental frequency or mean frequency of the voice while maintaining a feminine color to it. As we know the major determinants of vocal pitch are

tension, mass and length. The tension within the vocal folds can be increased by contraction of either bellies of the cricothyroid muscle. The pars recta is believed to tenses the vocal fold by the mechanism of rotation, thereby narrowing the visor angle between the thyroid and cricoid cartilages. On the other hand, pars obliqua is believed to tenses the vocal fold by the mechanism of translation[12]. The virtual increase in the tension within the vocal folds observed with the natural contraction of the cricothyroid muscle has led various authors to simulate the action of this later. Cricothyroid approximation is a perfect example for such a simulation. The increase in tension is thought to be far more important than the increase in length with this procedure. In a study by Neumann et al, the increase in tension resulted in an increase in the vocal pitch by five halftones on the average, in 94% of the cases[13]. To further increase the efficacy of cricothyroid approximation, this procedure has been coupled with sublaxation of the thyroid cartilage over the cricoid[14]. Attempts to incise the vocal cords longitudinally or to ablate part of the thyroarytenoid muscle have been described in conjunction with cricothyroidopexy or as separate procedures. The rational behind these surgeries is to decrease the mass per unit length of the vocal folds resulting in a subsequent increase in vocal pitch[15].

In a nutshell, cricothyroidopexy seems to be the most acceptable surgical intervention for raising the pitch in male to female transsexuals, with the effect being more pronounced on the modal frequency rather than the mean frequency [16]. One technical problem commonly encountered during the surgery is cutting of the sutures within the thyroid or cricoid cartilages. Various authors have described the usage of miniplate to prevent such complications. In this report, we are describing the usage of a silastic sheath that can be interposed between the cartilage and the sutures in order to circumvent breaking of the sutures or cutting through the cartilages. It is a simple and cheap material that is available in most hospital and can be cut and tailored according to the individual's needs. In the above described case, after a one year of follow up, the patient maintained his post-operative pitch. We believe that using a silastic sheath is an innovative method that can be used in cricothyroid approximation. A future study on a large number of cases is needed to document the efficacy of this new approach.

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