Type 1 thyroplasty using a novel and inflatable implant from APrevent® VOIS

BY SHIYING HEY AND YAKUBU KARAGAMA

Unilateral vocal cord immobility severely impacts voice, swallowing, and airway functions. A novel approach offers adjustable medialisation for improved patient outcomes.

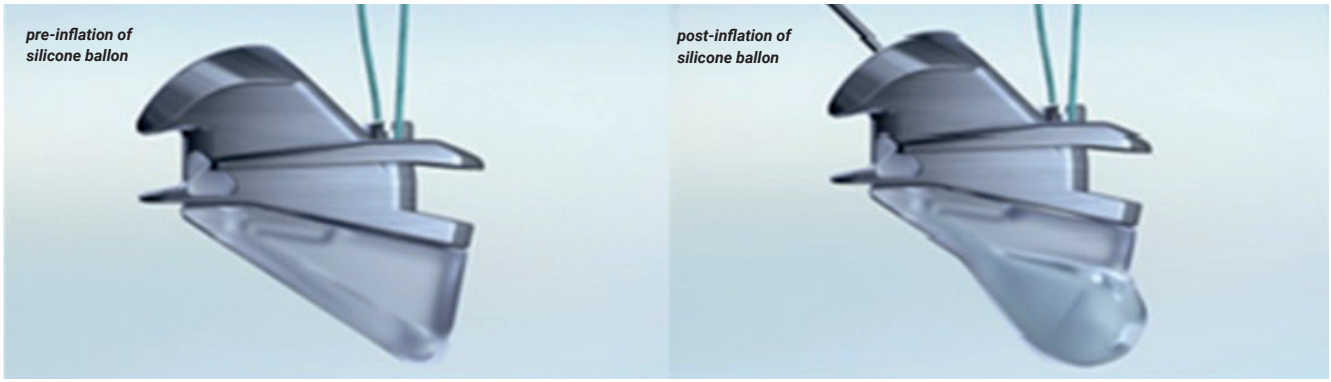

Figure 1: Adjustability of silicone balloon.

Unilateral vocal cord immobility (UVCI) can cause significant disability to voice, swallowing, and airway functions. Patients with UVCI may report a variety of symptoms including hoarseness, reduced vocal stamina, difficulty with volume projection, choking, coughing, aspiration, breathlessness and recurrent chest infections. The predominant causes of a UVCI are iatrogenic and malignancy [1]. Early referral to a laryngologist for management is essential to improve patients' quality of life.

In managing UVCI, the aim is to medialise the paralysed vocal cord to improve voice and prevent aspiration from glottal incompetence. In permanent UVCI, a definitive surgical treatment such as Isshiki type 1 thyroplasty using an implant with or without arytenoid repositioning or non-selective unilateral laryngeal reinnervation may be required [2].

Type 1 thyroplasty, described by the late Professor Isshiki in 1970s, remains a standard and effective treatment for symptomatic UVCI [3].

Introduced in 2019, the VOIS implant offers a novel and dynamic design allowing for adjustment of the medialisation effect for the paralysed vocal cord both intra- and postoperatively [4]. Unlike a static implant where the medialisation outcome is finalised at the time of insertion with an inbuilt inflatable silicone balloon (Figure 1), the VOIS implant allows further adjustment of the vocal process by either reinflating or deflating the balloon with normal saline, which can be performed in an outpatient setup. This unique feature is particularly valuable in overcoming any expectant progressive atrophy of vocal folds due to ageing effect, under or over-correction of the vocal cord medialisation, or changes in vocal habits and laryngeal biomechanics at a later stage.

Method

Our preferred anaesthetic technique for thyroplasty is under local anaesthesia using a long-acting agent (0.25% bupivacaine in 1:200,000 adrenaline, 10-20mls) onto the skin and subcutaneous tissues down to the level of thyroid lamina. For further intraoperative LA 'top-up', a short-acting agent (1% lidocaine in 1:200,000 adrenaline, 10-20mls) is used. The maximal amount of LA used should be adjusted according to the patient's weight.

A transnasal laryngoscopy to reconfirm the side of paralysis is routinely performed prior to starting. Co-phenylcaine-soaked neuro-patties applied into the anterior nasal cavities for topical decongestion

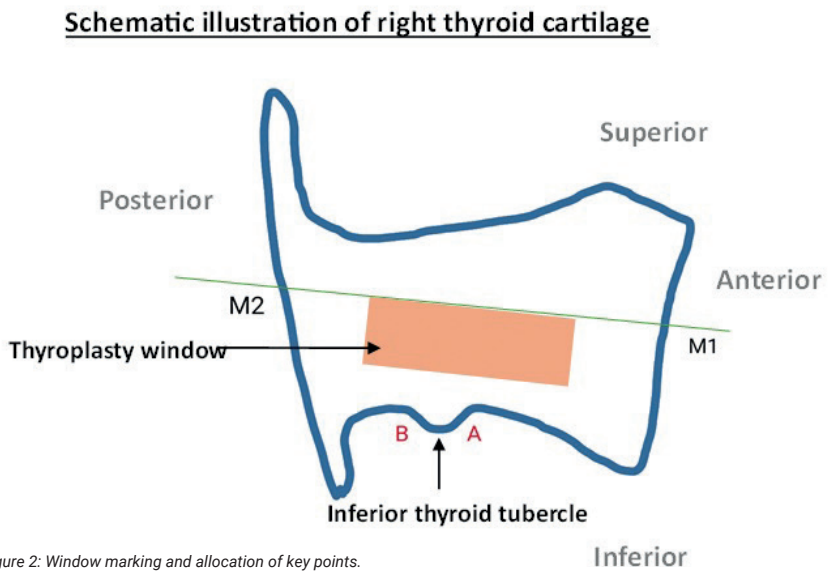

Figure 2: Window marking and allocation of key points.

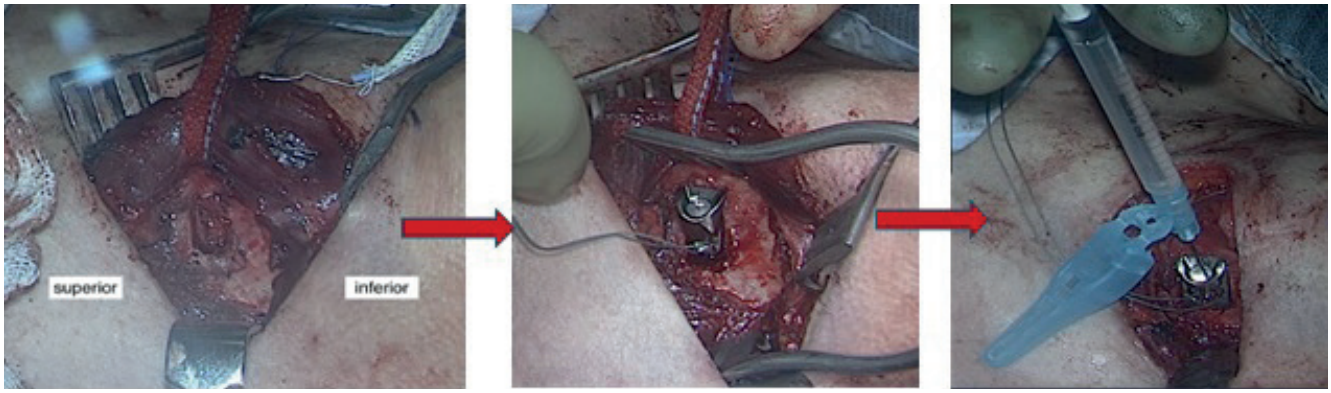

Figure 3: Thyroplasty window creation and insertion of a VOIS implant. Right-sided type 1 thyroplasty. (L-R): Creation of thyroplasty window; insertion of VOIS implant; intraoperative voice adjustment; injection of 0.9% sodium chloride with a 27G 1ml syringe (max 0.3ml) into the inflatable silicone cushion via the port membrane.

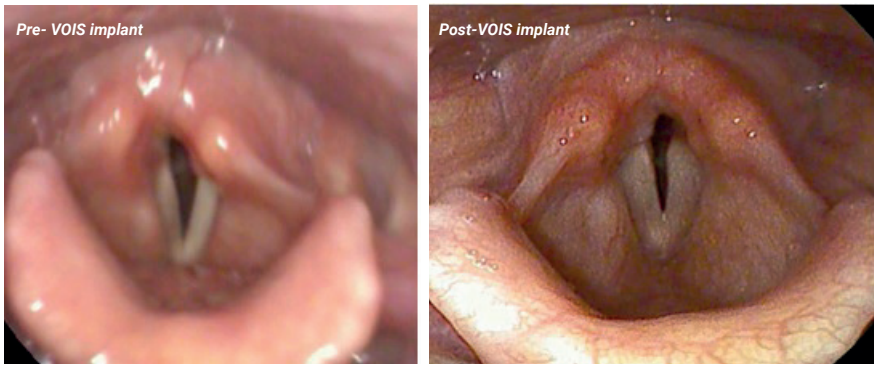

Figure 4: Pre and postoperative outcomes for an immobile left vocal cord.

and anaesthesia is preferred, rather than spraying into the nasal cavities to avoid anaesthetising the larynx and pharynx, causing unpleasant choking sensation during the procedure.

Incision and exposure of thyroid cartilage

- In a supine position, the patient's neck is mildly extended with a shoulder roll and head supported on a ring.
- Between the thyroid notch and upper cricoid cartilage, a 5cm horizontal incision is made on the ipsilateral side from midline to lateral along a skin crease line.
- A subplatysmal dissection is made, the strap muscles are identified, separated and retracted from the midline raphe.
- Using blunt dissection, the ipsilateral thyroid lamina with its four borders (superior, inferior, anterior and posterior) are fully exposed.
- To adequately bring the thyroid lamina into surgical view, 2x 3/0 Ethilon sutures can be placed adjacent to the thyroid notch for retraction and to be removed prior to wound closure.

Window marking and key points allocation

An 11x6mm rectangular thyroplasty window is measured and created using the supplementary VOIS instruments set (Figure 2). The steps are as follows:

- Using a calliper, the midpoint (M1) between the thyroid notch and inferior border of thyroid cartilage is measured. The posterior border of thyroid lamina is identified as M2.
- A line between M1 and M2 is drawn parallel to the inferior thyroid cartilage border. This line is then measured by the cartilage ruler from the instrument set to determine the implant's size (available in XS, S, M and L).
- The inferior thyroid tubercle is then identified, with its anterior and posterior points marked as A and B, respectively.
- Using an L-shaped stencil in reference to points A and B, the upper border of the thyroplasty window corresponding to the surface marking of the vocal cord is marked.
- The anterior border of the thyroplasty window is further defined using an assigned marker specific to each implant size.
- Once the superior and anterior borders of the window are confirmed, a pre-set 11x6mm window template is applied on thyroid cartilage and its position marked out using a monopolar diathermy.

Window drilling

- A 1mm fissure burr is used to create the thyroplasty window. The authors routinely drill in a 'postal stamp' fashion along the edges before joining up the 'dots'. If the cartilage is soft, this can be carved out using a size 11 blade. A diamond burr can be used to smooth the edges.
- It is important to avoid drilling deeper than the inner perichondrium as this can risk damaging the vocal cord. A Freer dissector is used to carefully peel the cartilage from the underlying perichondrium.
- Once completed, a rectangular 'window size checking gauge' is applied to confirm accurate window sizing, before testing the implant fitting using an 'implant checking gauge'.
- The perichondrium often needs to be undermined from the thyroid cartilage, particularly in the posterior aspect of the window, to facilitate implant placement.

Implant insertion and voice adjustment (Figure 3)

- Prior to implant insertion, the inflatability of the silicone balloon is tested to its maximal filling volume with 0.9% saline via a 24G needle.
- The VOIS implant is inserted into the thyroplasty window and secured to thyroid lamina with a screw on a fixation plate and a sliding suture.
- The patient's head position is restored to a neutral position before testing for voice outcome. By injecting saline into the inflatable silicone cushion, the patient's voice is adjusted to their desired outcome. Once the patient is satisfied with their voice, a nasendoscopy is performed to check the position of the implant and its medialisation outcome.

Closure

- An 8Fr low-vacuum suction drain is placed and can be removed the next day (optional).
- Neck wound is closed in layers: 3/0 Vicryl interrupted sutures to strap muscles and platysma, 4/0 Monocryl subcuticular sutures to skin.

Potential limitations

- In patients requiring revision thyroplasty, the VOIS implant may not be a suitable option as encountered in some of our patients. This can often be due to the

previously created thyroplasty window being misplaced or too large in size to allow placement of the VOIS implant template. In these cases, a tailored silicone implant serves as a reliable alternative.

Key points

- It is recommended to perform type 1 thyroplasty under local anaesthesia, ideally without sedation, for a more reliable tailoring of voice outcome intraoperatively.
- The VOIS implant offers a unique feature for adjustment of optimal medialisation effect both in the intra- and postoperative periods.
- In our experience, VOIS represents a safe and effective implant option in UVCI patients in achieving satisfactory glottal closure (Figure 4).
- With its three-dimensional spacer effect, the silicon cushion, when inflated, can exert postero-medial expansion onto the vocal process. This can effectively close the posterior glottal gap and may improve on arytenoid position and/or height and length mismatch commonly encountered in UVCI patients (Figure 4).

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Declaration of competing interests: APrevent®, the maker of the VOIS implant support YK's course, both financially and with equipment for dissection.

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