Endolaryngeal thread guide instrument (ETGI)

The endolaryngeal thread guide instrument (ETGI) is a relatively new development in the world of otorhinolaryngology and head and neck surgery [1]. In this article, we discuss using the ETGI for a minimally invasive endoscopic arytenoid lateropexy (EAL). The instrument can be used in the treatment of bilateral vocal cord immobility such as vocal cord paralysis, posterior commissure stenosis, ankylosis of crico-arytenoid joint and laryngeal web. It has also been successfully used in revision cases of failed glottis enlarging procedures.

The structure of the ETGI enables us to penetrate into the densest part of the thyroid cartilage. In this way, endoscopic arytenoid abduction lateropexy can be achieved by a double thread loop creation in one step. The laryngeal anatomical structures remain intact, which has many advantages in terms of therapeutic effect.

The airway enlargement is reversible to a large extent, so the laryngeal functions can be preserved in case of temporary inferior laryngeal nerve injury, or when this procedure is used for the prevention of restenosis, for example in the case of posterior glottic stenosis.

This is also a cost effective procedure, as the time the patient spends in theatre and post-operative care is reduced. Moreover, it simplifies the pre-operative assessment procedure and minimises the need for external procedures such as tracheostomy, laminotomy, etc.

Before the procedure the patient’s status should be assessed for infection, immune deficiency, post-chemo-radiotherapy or any other disease may cause inter or post-operative morbidity. These patients will need more complex administration of antibiotics.

Description of the instrument
The key component of the ETGI is based on a built-in, moveable, curved blade with a lacing hole (eye) at its tip in order to guide a thread in or out between the outer surface of the neck and the laryngeal cavity (Figure 1).

The stem of the instrument is a rigid steel pipe with a curve at its distal, blade-holding end, created to fit into medium sized laryngoscopes. Considering the size differences of the larynx, three different measures of the steel pipe were designed with appropriate blades. The connection between the blade and the rod is fixed but flexible, ensuring forceful blade movement on exit and re-entry of the curved stem end. The blade is moved by a rod which is largely cased within the stem.

At the uncased proximal end of the rod is a freely rotating finger clip. The pull and push of the finger clip (with the thumb) causes the in-and-out blade movement from the stem end. At rest, the blade is completely cased. The last component of the instrument is the ergonomic handle, which also serves as a shaft to hold the instrument in a straight position. The stem of the instrument is fixed to the handle with a clamping screw after turning it to the desired direction. The appropriate structural rigidity of the ETGI ensures penetration through the special points of the thyroid cartilage [1].

Figure 1: Endolaryngeal thread guide instrument (ETGI).
Surgical technique

For better manoeuvrability, the biblade laryngoscope is suggested to expose the larynx. Afterwards, the mobility of the cricoarytenoid joints is examined by passive mobilisation. A rigid or ankylositic joint is mobilised by a strong right-angled endolaryngeal scythe designed by the authors. Then, the ETGI is led through the laryngoscope to the level of the glottis.

The arytenoid cartilage is tilted backwards and upwards with the tip of the instrument, and then the cased curved blade is pushed through under the vocal process of arytenoid cartilage out to the surface of the neck (Figure 2).

Following this, a non-absorbable thread (Prolene 1.0) is laced up to its midpoint through the eye of the blade. The thread folded this way is pulled back to the laryngeal cavity. After a repeated tilting of the arytenoid cartilage, the blade with the thread is pushed out above the vocal process. After cutting out the thread from the blade the instrument is withdrawn (Figure 3).

A 0.5cm skin incision is necessary for pulling back the thread ends to the level of the sternohyoid muscle to knot the autologous ends on its surface. This technique enables the creation of a double loop in one step, in the appropriate spot. The cut skin of the neck is re-edged with sterile strips or 4.0 Prolene suture (Figure 4).

Post operative care and follow-up

As a result of contact with the thyroid cartilage, high dose steroid and antibiotic administration is necessary for at least 4-7 days. In order to monitor for potentially reversible paralyses, patients are endoscopically followed up regularly, every 2-4 weeks. The sutures can be removed through a small skin re-incision if recovery is confirmed.

Advantages of the procedure

The accurate loop creation for EAL is safe and quick by ETGI. This provides a remarkable and long lasting breathing improvement right after the surgery (Figures 5-6).

Patients who wore a cannula before surgery can be de-cannulated during the first post-operative days. Further advantages of this compact technique compared to previous suture lateralisation techniques are:

- It can be applied easily in cases where there are difficulties with direct laryngoscopy (use of Macintosh laryngoscope)
- The double loop creation with one manoeuvre, aside from increased efficiency, diminishes the risk of vocal cord...
medialisation (e.g. a rupture of one of the sutures)
- The thread moves within the disinfected laryngeal cavity and the skin, hence drug administration (to avoid oedema and perichondritis) can be diminished
- Preservation of the laryngeal fine structures ensures reversibility by simple removal of the loops
- Preservation of the mucosa of aryepiglottic fold and interarytenoid regions maintains the integrity of the protective laryngeal reflex [3], thus aspiration is negligible. As far as serious post-operative aspiration, which presented mostly in fluid intake, we found this markedly diminished after 2-7 days, as proven by radiological examinations (Barium swallow), and generally completely disappeared after a few weeks. The method utilises the normal mechanism of abduction, so the possible contraindications are limited. However, our series has pointed out the potential complications as well. For example, suppressed immune status or ongoing airway infection may be relative contraindications.

Conclusion
Combined with simple and readily available methods, minimally invasive endoscopic arytenoid lateropexy may serve as the basis for an effective, dynamic solution even for the most difficult bilateral vocal fold immobility (VFI) with the preservation of fine laryngeal structures. The ETGI simplifies and facilitates this procedure with the rapid and safe creation of a double fixating loop at the proper position. Since there are different sizes of blades with different types of curvatures available, it can be used in a number of anatomical variations. With great extent of reversibility, easily detectable laryngeal function recovery, and good functional results, this surgical procedure may simplify the management of these patients in the long term. Thus, unnecessary diagnostic and therapeutic endeavours can be avoided in cases of usually iatrogenic etiology.

References

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