



Tongue base suspension procedures for obstructive sleep apnea syndrome

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It is generally accepted that obstructive sleep apnea syndrome (OSA) results from the combination of a structurally small upper airway and abnormal airway collapsibility during sleep. Treatment of OSA, therefore, is directed at preventing airway collapse. For those patients who do not respond to conservative medical management such as positional therapy and weight loss, or are unable to tolerate or comply with positive pressure ventilation (continuous positive airway pressure, bilevel positive airway pressure, and other modalities) or mandibular advancement devices, surgical intervention remains the last option. Surgical treatments that target tongue base and hypopharyngeal collapse traditionally included partial glossectomy, midline glossectomy, linguoplasty, mandibular osteotomy with genioglossus advancement, and maxillary-mandibular advancement. Many of these procedures are associated with extreme morbidity and are not readily accepted by patients as treatment options. In search of minimally invasive alternatives, otolaryngologists began looking at other potential methods of anterior displacement and stabilization of the base of tongue.

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Introduction

In 1992, Faye-Lund et al² reported a new technique¹ called glossopexia using fascia lata as a sling in the tongue. The ends of the harvested fascia sling were attached at drill holes in the mandible and sutured together after maximal anterior suspension of the tongue. In 1997 DeRowe et al³ described a pharyngeal suspension suture technique using the In-Fast bone screw anchoring system originally developed for transvaginal cystourethropexy (Influent Inc.). The Repose system, Food and Drug Administration approved in 1998 for treatment of OSA, included a disposable battery-operated low-RPM backward-drilling drill, a self-drilling and self-tapping screw with attached loop of Number 1 monofilament polypropylene suture, a spring-loaded suture passer, and a perforated metal tongue

depressor that improved exposure of the base of the tongue (Figure 1). The goal was to anchor a bone screw into the lingual cortex of the mandibular symphysis and loop the attached suture into the posterior tongue base.³ The original technique was performed intraorally by making an incision along the lingual frenulum, posterior to the submandibular ducts, and bluntly dissecting in the midline to expose the lingual cortex of the mandible. The anchor screw was placed close to the genial tubercle below the tooth roots. The suture loop was cut and a suture was passed posteriorly with the suture passes through the floor of mouth incision and exiting at approximately 1 cm lateral to midline raphe at the level of circumvallate papillae. The suture passer was then used to pass a temporary suture loop from the floor of the mouth incision to exit 1 cm lateral to the midline, on the opposite side of the base of the tongue. A free Mayo needle was then loaded on the end of the polypropylene suture and plunged into the tongue at the point of initial suture exit at a depth of approximately 2–3 mm. The needle tip exited next to the suture loop on the contralateral side. The polypropylene suture was then threaded through the temporary suture loop

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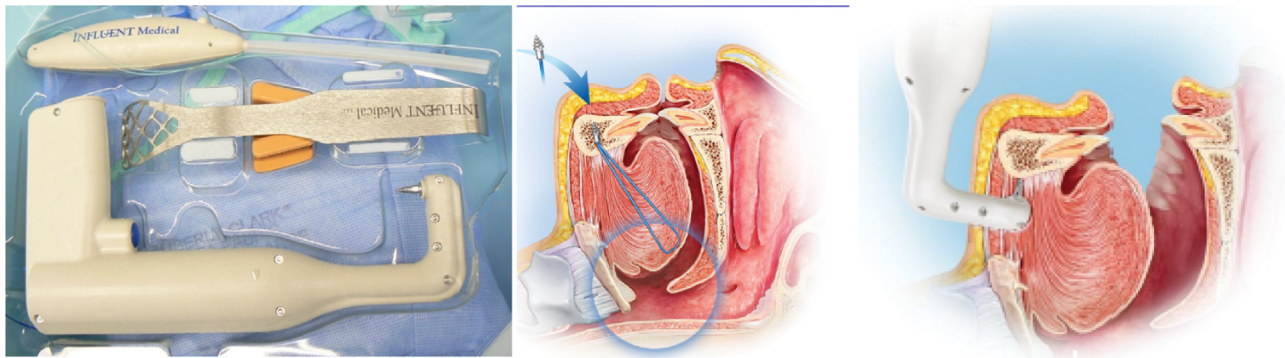


Figure 1 AIRvance Bone Screw System and the technique of tongue suspension. (Color version of figure is available online.)

and pulled anteriorly to exit the incision in the floor of the mouth and leading to the desired triangulation. The 2 polypropylene sutures are then tied together while tension is maintained to create a slight depression in the base of the tongue. In an effort to avoid potential injury to the floor of the mouth (Wharton's duct system, fibrosis of the floor of mouth),⁴ Omur et al⁵ in 2005 described a change to the De Rowe technique by introducing the sling suture via a submental approach with the anchoring to mandibular symphysis. Medtronic acquired the Repose system in 2011, and the name was changed to AIRvance. The technique of suspension has remained unchanged and is performed by most surgeons through the submental approach.

Patient selection

Selection of the best candidates for this technique is based on anecdotal reports, clinical experience, and a few surgical case series. Contraindications to this procedure include poor general medical health or primary upper airway obstruction in the retropalatal region. In addition, relative contraindications include macroglossia, abnormal mandible bone, poor oral hygiene, and severe periodontal disease, and history of radiation or history of root canal procedures in the mandibular midline incisors. As this procedure conceptually does not actively advance tissues, patients with severe

obstruction due to excessive tissue volume of the tongue or lateral walls would probably not respond.⁶ Woodson et al⁷ described inclusion and exclusion criteria recently.

Inclusion criteria

1. Adult patients (18-65 years) with moderate to severe OSA (apnea hypopnea index = 15-60);
2. clinical findings consistent with tongue-related hypopharyngeal upper airway obstruction; and
3. failure or refusal of medical treatment with nasal positive airway pressure.

Exclusion criteria

1. Morbid obesity (body mass index > 32 kg/m²);
2. enlarged tonsils (3+ and 4+);
3. anatomically unable to accommodate implant;
4. severe mandibular deficiency;
5. severe nasal obstruction;
6. systemic infection;
7. history of any of the following: head and neck or respiratory tract cancer, radiation therapy to head and neck, and dysphagia; and
8. anesthesia class (American Society of Anesthesiologists) 4 or 5.

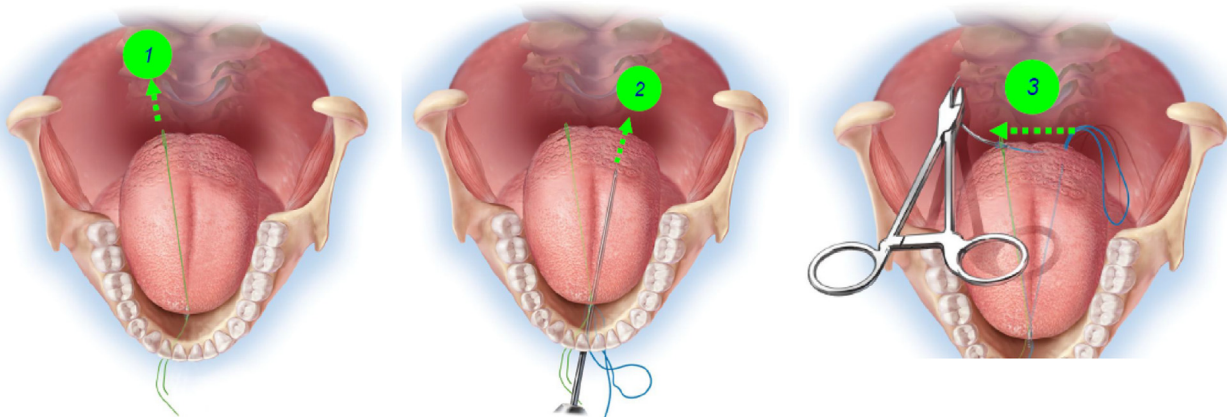


Figure 2 Suture pass (steps 1-3). (Color version of figure is available online.)

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