Transcervical Tongue Base Reduction with Hyoepiglottoplasty: Long-Term Results

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Abstract *Aims* To evaluate the long term results of tongue base reduction with hyoepiglottoplasty as a surgical option in the treatment of severe obstructive sleep apnea. *Material and Method* Severe obstructive sleep apnea patients diagnosed as upper airway narrowing at the tongue base level were treated with transcervical tongue base reduction with hyoepiglottoplasty. Seven years after single stage multilevel surgery, the patients were reevaluated clinically, radiologically and polysomnographic records were taken. Preoperative, early postoperative and long-term postoperative parameters were compared to determine the success rate of the surgical technique. *Results* In the postoperative long-term follow-up Epworth sleepiness scale (ESS) scores were reduced to 4 and 6 respectively 2 months after surgery despite the initial values of 17 and 15. BMI were decreased from 29.7 and 27.9 kg/m² respectively to 26 and 24 kg/m². The apnea/hypopnea index (AHI) were reduced to 14.1 and 16.2 respectively from 68.6 and 83.83. O₂ nadir was 55 and 66% respectively and improved to 86 and 89%. Flexible nasopharyngoscopy revealed competent airway in both retropalatal and retroglottal level. Bed partners scored snoring as 2/10 and 4/10 corresponding to very mild and moderate. Daytime

somnolence and witnessed apneic periods were completely disappeared in both patients. *Conclusion* Open tongue base resection with hyoepiglottoplasty is effective among all other surgical corrections of sleep apnea even after 7 years postoperatively.

Keywords Tongue base reduction · Hyoepiglottoplasty

Introduction

Tongue base hypertrophy is an important anatomic pathology that blocks the upper airway causing obstructive sleep apnea and hypopnea syndrome (OSAHS) [1]. Surgery of the tongue base has always been more challenging than that of palatal ones. Many surgical techniques have been described to treat tongue base obstruction in the recent years. These techniques have increased cure rates even in severe cases [2].

The surgical approaches focused on the tongue base are mainly classified as the techniques that pull the tongue base forward or reduce the tongue base volume. Techniques reducing the tongue base volume are open surgical tongue base reduction with hyoepiglottoplasty, submucosal intralesional excision with or without endoscopy, radiofrequency volumetric tongue base reduction, laser midline glossectomy and midline glossectomy with lingualplasty [3].

Tongue base reduction with hyoepiglottoplasty, initially described by Chabolle [4] enables enlargement of the posterior airway space at the tongue base. This surgical approach provides widest resection possible in the tongue base while having the advantage of preserving the hypoglossal/lingual artery neurovascular bundle. Meanwhile the hyoepiglottoplasty generates pharyngeal lateral wall stabilization and prevents collapse of epiglottis [5, 6].

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Although surgery is not preferred in CPAP compliant patients, noncompliant patient management necessitates surgical options varying according the level of the obstruction.

We present the long term results of cases treated with this technique and completely describe this successful technique to prevent the collapse at the tongue base level. The IRB approval of Yeditepe University Medical Center was obtained and the informed consent was taken from the patients.

Materials and Methods

Surgical Technique by Steps

General anesthesia with endotracheal intubation is performed and a tracheostomy is opened. Endotracheal tube is replaced by another intubation tube placed through the tracheostomy.

Neck incision is placed approximately 3 cm below and parallel to the lower border of the mandible. An inferiorly based flap is elevated to expose the thyroid cartilage in the subplatysmal plane. Supraplatysmal and intraplatysmal fat tissue over the digastric muscle is resected. Suprahyoid muscles (mylohyoid and geniohyoid) are divided along the cephalic border of the hyoid and the vallecular mucosa is exposed (Fig. 1).

Fig. 1 Suprahyoid muscles are divided and the vallecular mucosa is exposed

Great care is taken to find and secure the hypoglossal nerve and lingual artery bundles on both sides of the tongue base and they are isolated gently (Fig. 2). Once the pharyngeal entrance through the vallecula is accomplished, the tongue base is resected up to the circumvallate papilla anteriorly and the lingual tonsillar folds laterally. The tissue volume excised is measured (Fig. 3).

Hyoid greater cornu, epiglottis and tongue are approximated in both sides totally with six sutures using 2/0 vicryl. Geniohyoid and mylohyoid muscles are sutured to the hyoid periosteum with 2/0 vicryl. Infrahyoid muscles are dissected from the hyoid bone with monopolar electrocautery (Valley Lab Force 300, Valley Lab, Colorado, USA). Two burr holes 1 cm lateral to the midline are formed on both sides of the mandible. Then the hyoid bone is approximated to the mandible with 2/0 vicryl sutures passing through these burr holes and the hyoid.

The platysmal and the subcutaneous tissues are sutured with 4/0 vicryl, skin with 5/0 prolene and a drain was placed.

The intubation tube is replaced by a tracheotomy tube (Tracoe, Frankfurt/Main) and a nasogastric tube is placed and fixed.

Patients are monitored in the intensive care unit during the first 24 h. In the early postoperative period, intravenous broad spectrum antibiotics, analgesics and proton pump inhibitors were given. The nasogastric feeding is started in the postoperative first day with the dose of 25 cc/h in doubling amounts in every 6 h. Fluid balance is followed regularly. Decannulation period is usually between the

Fig. 2 Hypoglossal nerve and lingual artery bundles are secured

Fig. 3 Tongue base is resected up to the circumvallate papilla anteriorly and the lingual tonsillar folds laterally

5–10 days postoperatively. The nasogastric tube is removed between 8 and 12 days.

Case 1

Thirty-four-years-old male patient was admitted with the complaints of loud snoring, daytime somnolence and witnessed apneic episodes during sleep. ESS score was 17 and his BMI was 29.7 kg/m².

The physical examination was carried out with fiberoptic nasopharyngoscopy. Oropharyngeal examination revealed the modified malampati grade as 3. The nasopharyngoscopy and the Mueller maneuver revealed anteroposterior narrowing at the tongue base level.

Cephalometric graphies were obtained under scopy with C-arm (Philips Integris V 3000 Holland) and analyzed with Philips Easy Vision Program. Sella-nasion-subspinal point A (SNA) and sella-nasion-supramental point B (SNB) angles were determined in all patients to rule out the craniofacial skeletal abnormalities. Posterior airway space (PAS) and mandibular plane-hyoid bone (MP-h) lengths were calculated with cephalometric analysis. No craniofacial skeletal abnormality was detected but the posterior airway space was narrowed at the retroglossal level and the hyoid bone was placed inferiorly due to hyolingual complex pathology. Total lingual area and submandibular lingual area measurement on MRI revealed hyolingual complex abnormality. Total lingual area was 31 cm².

In the preoperative polysomnography, the apnea/hypopnea index was 68.6 and O₂ nadir was 55%. He did not want to use CPAP due to poor compliance following

2–3 months trial interval and insisted on having the surgery.

He was scheduled for multilevel surgery including uvulopalatal flap and transcervical tongue base reduction with hyoepiglottoplasty.

Transition to oral feeding from nasogastric tube was achieved on the postoperative ninth day. Tracheal decannulation was on the postoperative tenth day. He was discharged on the postoperative 12th day without any complication.

During the postoperative first year, he had monthly follow-up. ESS was four after 2 months and BMI was reduced to 26 kg/m². The pharyngeal airway assessment with flexible nasopharyngoscopy revealed enlargement in the anteroposterior and transversal diameters. In the postoperative long-term follow-up (seventh year) his BMI index and ESS was unchanged and was the same of the postoperative second month. His bedtime partner scored snoring as two in a scale of ten implying very mild snoring. Daytime somnolence and witnessed apneic periods were completely disappeared. Flexible nasopharyngoscopy revealed competent airway in both retropalatal and retroglossal level. The control PSG had AHI as 14.1 and O₂ nadir as 86%.

Case 2

Forty-seven-years-old male was admitted with the same complaints as of the first patient. His ESS score was 15, BMI was 27.9 kg/m², modified malampati grade was four. He was hypertensive for the last 5 years and his blood pressure was controlled by diet and antihypertensives. No craniofacial skeletal abnormality was detected in the cephalometric analysis but the posterior airway space was narrowed at the retroglossal level and the hyoid bone was placed inferiorly due to hyolingual complex pathology. Total lingual area was 29 cm². The apnea/hypopnea index was 83.83 and O₂ nadir was 66%. He also denied to use CPAP following 2–3 months trial interval and preferred surgery.

He had multilevel surgery including nasal airway reconstruction, uvulopalatal flap and transcervical tongue base reduction with hyoepiglottoplasty.

Transition to oral feeding from nasogastric tube was achieved on the postoperative eighth day. Tracheal decannulation was on the postoperative ninth day. He was discharged on the postoperative 11th day without any complication.

In the postoperative second month, his ESS was six. Nasopharyngeal examination revealed enlarged airway at retroglossal level. His BMI was reduced to 24 kg/m². His daily activities were increased despite shortened night sleep. His cardiologist decided to follow blood pressure

without medical treatment since blood pressure was returned to normal limits. Complaints of snoring, daytime somnolence and apneic periods observed by bed partner were completely disappeared. Bed partner scored snoring level as 3–4 (mild) and was found satisfactory. Postoperative seventh year control polysomnography revealed that AHI was reduced to 16.2 and O₂ nadir was 89%.

Discussion

In severe obstructive sleep apnea with hyolingual complex pathology, incompliance with CPAP necessitates an alternative and effective treatment modality. Since the disease has mostly multilevel pathology, UPPP cannot be the only solution. In such cases multilevel surgery, especially addressing the tongue base, is preferred.

In the presence of soft tissue pathology at the retroglottal level, tongue base reduction with hyoepiglottoplasty generates an evident increase in the oropharyngeal airway size [5]. This procedure enables safe tongue base excision after the identification of the lingual neurovascular bundle.

There are other surgeries defined previously to reduce the tongue base volume. The success rate of transoral laser midline glossectomy was reported as 25% in the severe apneics [7]. When combined with lingualplasty success rate was increased to 77%. Disadvantages of this technique are high complication rates and difficulty in the exposure of the tongue base compared to our technique [8]. Radiofrequency volumetric tongue base reduction success rates were 30–50% reported in certain published data [9]. Improvement rates may be as high as 90% if the tongue base reduction with radiofrequency is performed through a cervical approach, but success rates may still decrease in long term due to relapses are frequent with radiofrequency [10].

Short term follow-up data concerning outcomes exist in literature but long term follow-up data is extremely rare. The success rates are usually defined in the early postoperative period but relapses on the long term are not uncommon. OSAHS patients must be followed long life owing to the multisystemic feature of the disease and the precision of long term follow-up to evaluate outcomes of the treatment modalities.

There are many reports in the literature involving particular surgical technique in terms of efficacy and success rate. In this report our intention is to present the long term results of two cases following TBRHE. The number of patients is our major limitation and no statistical analysis could be added. We intended to reveal the preliminary long term results (average 94 months) of this technique.

Bed partners of both patients were satisfied to find the snoring level decreased. Patients were satisfied with the

decrease and disappearance of daytime sleepiness. ESS and BMI were significantly reduced. In the long term follow-up, reduction in ESS and BMI were preserved in both of the patients.

The potential postoperative complications of this technique might be pharyngocutaneous fistula, bleeding, infection, swallowing and speech problems. Fortunately in both of our cases the postoperative period was uncomplicated. Absorbable suture and postoperative antibiotics were used to prevent the formation of submental abscess [4].

The tongue base reduction with hyoepiglottoplasty has been proven an effective, safe and one stage surgical procedure in the treatment of severe obstructive sleep apnea with hyolingual complex pathology. We have found quite favorable outcomes with respect to overall success rate and improvement. The positive results observed are worth to be noticed since the management of severe OSAHS patient incompliant with CPAP is still going to be difficult and challenging task. Additional studies with larger series may be necessary to evaluate the long term efficacy of the technique.

References

1. Mann EA, Burnett T, Cornell S, Ludlow CL (2002) The effect of neuromuscular stimulation of genioglossus on the hypopharyngeal airway. *Laryngoscope* 112:351–356
2. Sorrenti G, Piccin O, Scaramuzzino G, Mondini S, Cirignotta F, Cerroni AR (2004) Tongue base reduction with hyoepiglottoplasty for the treatment of severe OSA. *Acta Otorhinolaryngol Ital* 24:204–210
3. Kezirian EJ, Goldberg AN (2006) Hypopharyngeal surgery in obstructive sleep apnea: an evidence-based medicine review. *Arch Otolaryngol Head Neck Surg* 132:206–213
4. Chabolle F, Wagner I, Blumen MB et al (1999) Tongue base reduction with hyoepiglottoplasty: a treatment for severe obstructive sleep apnea. *Laryngoscope* 109:1273–1280
5. Chabolle F (2003) Lower pharyngeal airway surgery, tongue base reduction with hyoepiglottoplasty for severe obstructive sleep apnea. In: Fairbanks DNF, Mickelson SA, Woodson BT (eds) *Snoring and obstructive sleep apnea*, 3rd edn. Lippincott Williams & Wilkins, Philadelphia, pp 194–198
6. Lauretano AM, Li KK, Caradonna DS, Khosla RK, Fried MP (1997) Anatomic location of the tongue base neurovascular bundle. *Laryngoscope* 107:1057–1059
7. Mickelson S, Rosenthal L (1997) Midline glossectomy and epiglottidectomy for obstructive sleep apnea syndrome. *Laryngoscope* 107:614–619
8. Woodson BT, Fujita S (1992) Clinical experience with lingualplasty as part of the treatment of severe obstructive sleep apnea. *Otolaryngol Head Neck Surg* 107:40–48
9. Woodson BT, Nelson L, Mickelson SA et al (2001) A multi-institutional study of radiofrequency volumetric tissue reduction for OSAS. *Otolaryngol Head Neck Surg* 125:303–311
10. Blumen MB, Coquille F, Rocchiccioli C, Mellot F, Chabolle F (2006) Radiofrequency tongue reduction through a cervical approach: a pilot study. *Laryngoscope* 116:1887–1893