

Microtrapdoor Flap Technique for Treatment of Glottic Laryngeal Stenosis: Experience With 34 Cases

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Summary: Objectives. Laryngeal stenosis is the most challenging disorder for the laryngologist to treat. Microtrapdoor flap technique was described in 1980s; however, it has not been popular since then. The reason may be the difficulty of the technique. In this study, we will report our experience with microtrapdoor flap technique to treat glottic stenosis of 34 patients.

Study Design. Retrospective case series of a tertiary referral center.

Methods. Twelve male and 22 female patients make up our study group. All patients, but one, had pure glottic stenosis. The other patient had combined supraglottic and glottic stenosis. Unilateral or bilateral microtrapdoor technique was applied to all patients. The patients are required to have at least 1 year postoperative follow-up.

Results. The etiology of glottic stenosis includes 19 cases due to failed surgery for bilateral vocal fold paralysis; seven cases due to microlaryngoscopy (three laryngeal papilloma, one leukoplakia excision, one glottic cancer excision, one foreign body extraction, one biopsy from interarytenoid region); four cases due to prolonged intubation; one case due to laryngeal fracture, one case due to vertical laryngectomy, one case due to smoke inhalation (burn), and one case congenital or idiopathic. Seventeen patients had tracheotomy. All seventeen of them were decannulated 2 months postoperatively. Thirty-three patients (97%) were dyspnea free on exertion 1 year postoperatively. One patient developed restenosis and dyspnea 1 year after treatment; she needs retreatment.

Conclusions. Microtrapdoor flap technique is a successful surgical option for treatment of short-segment laryngeal stenosis.

Key Words: Larynx–Laryngostenosis–Airway obstruction–Tracheotomy–Laryngoscopy.

INTRODUCTION

Laryngeal stenosis is the most challenging disorder for the laryngologist to treat. Etiology of laryngeal stenosis may be prolonged endotracheal intubation, external trauma to anterior neck, and intralaryngeal trauma in the form of previous laryngeal surgery or radiation therapy. The treatment of subglottic stenosis is well defined: Radial laser incisions and balloon dilatation for short and soft stenosis and anterior and/or posterior costal cartilage grafting of cricoid cartilage with or without stenting for long and hard stenosis.^{1–3} Glottic stenosis treatment is less well defined; options are posterior cordotomy, partial or total arytenoidectomy, and posterior costal cartilage grafting of cricoid cartilage with or without stenting. Our information about supraglottic stenosis is rather scarce.⁴

Myer et al¹ defined a staging system for pediatric laryngotracheal stenosis on the basis of the relative reduction in cross-sectional area of the stenosis. McCaffrey² developed a staging system for adult laryngotracheal stenosis on the basis of the level and thickness of subglottic stenosis. Unfortunately, there is no staging system for glottic stenosis, yet. Therefore, the severity of glottic stenosis is hard to define.

Microtrapdoor flap technique for laryngeal stenosis was described first in 1984 by Dedo and Sooy⁵ from San Francisco,

California. A trapdoor is a sliding or hinged door, flush with the surface of a floor, roof, or ceiling, or in the stage of a theater. Microtrapdoor flap is a microlaryngoscopic elevation of mucosal flap, removal of submucosal tissues with cold knife or laser, and redraping of mucosal flap on the de-epithelialized surface. However, it has not been popular since then. The reason may be the difficulty of the technique.

In this study, we will report our experience with microtrapdoor flap technique to treat glottic stenosis of 34 patients.

METHODS

This study was approved by the institutional ethics committee of our university (number GO 15/18). The study was performed in accordance with the ethical standards laid down in the Helsinki Declaration of 1975 as revised in 1983.

Our retrospective chart review revealed 34 cases of laryngeal stenosis who were treated by using microtrapdoor technique in our department between 2005 and 2013. During the same period, 42 (47% [42/90]) adult patients with laryngeal stenosis were treated with open surgery in the form of partial cricotracheal resection and anterior and/or posterior cricoid split with costal cartilage grafting. Additionally, 14 (16% [14/90]) adults with laryngeal stenosis were treated with cold knife or CO₂ laser incision and dilatation during the same period. Those patients who were previously treated in another center for laryngeal stenosis were not included in the study. Twelve male and 22 female patients made the study group. Their ages ranged between 9 and 73 years and their mean age was 43 years. One patient had combined supraglottic and glottic stenosis, and the others had pure glottic stenosis. As this is a clinical series of glottic stenosis patients, not a part of a prospective study, these patients were diagnosed and followed up by using outpatient

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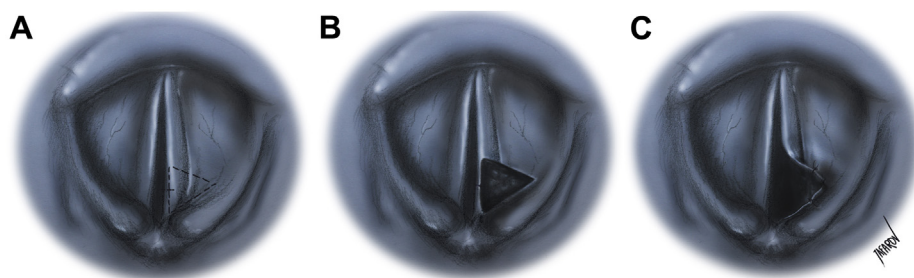


FIGURE 1. Endoscopic microtrapdoor flap surgery steps shown as a drawing. (A) Medially based triangular mucosa incision and excision with CO₂ laser. (B) Scar tissue excision deep to the *triangle* until below the lowermost level of stenosis. Mucosa of medial base of *triangle* is carefully preserved. (C) Mucosa of medial base of *triangle* is cut in the middle vertically toward subglottis until below the stenosis. Anteriorly and posteriorly based mucosal flaps are obtained. These flaps are sutured with 5/0 vicryl to the apex of *triangle*.

telescopic examination. Pulmonary function tests were not performed in the evaluation and follow-up of these patients. The patients were required to have at least 1 year postoperative follow-up.

The etiology of laryngeal stenosis was failed surgery for bilateral vocal fold paralysis in 19 cases, microlaryngoscopy (three laryngeal papilloma, one leukoplakia excision, one glottic cancer excision, one interarytenoid biopsy, one foreign body extraction) in seven cases, prolonged intubation in four cases, laryngeal fracture in one case, vertical laryngectomy in one case, smoke inhalation (burn) in one case, and congenital or idiopathic in one case.

Surgical technique

The patient was intubated transorally or through the tracheotomy under general anesthesia. Metal laryngoscope was inserted into patient's throat and fixed right above the stenotic area. Mucosal incision was done with 5-W CO₂ laser in continuous mode. Trapdoor flap was either anteriorly, posteriorly, inferiorly, or superiorly based depending on the stenosis. Submucosal stenotic tissue was excised with laser or cold knife until laryngeal cartilage was reached. Trapdoor flap redraped the open surgical wound and sutured with 5/0 vicryl sutures to the surrounding mucosa. Tracheotomized patient was reexamined 2 months later; if he had adequate airway, he was decannulated.⁶⁻⁸

An alternative technique involved medially based triangular mucosa excision with CO₂ laser and scar tissue excision deep to this triangle until below the lowermost level of stenosis. Mucosa of medial base of triangle is carefully preserved; it is cut in the middle vertically toward subglottis until below the stenosis. Anteriorly and posteriorly based mucosal flaps are obtained. These flaps are sutured with 5/0 vicryl to the apex of triangle (Figures 1–6). If necessary, the same technique is performed on the other side.⁹

RESULTS

Because there is no staging system for glottic stenosis, we classified the severity of our cases on the basis of thickness of stenosis, cross-sectional area of stenosis, presence of posterior glottic stenosis, and presence of tracheotomy. On the basis of thickness of stenosis, 28 patients had stenosis ≤1 cm thick, and six patients had stenosis >1 cm thick. Four patients had ste-

nosis of up to 50% cross-sectional area of airway; 10 had 51–70%, and 20 had 71–99%. Fifteen patients had posterior glottic stenosis and 19 patients did not. Seventeen patients with 71–99% obstruction had preoperative tracheotomy. All seventeen of them were decannulated 2 months postoperatively.

The patients had minimum 24 months and maximum 120 months postoperative follow-up. Mean follow-up was 52 months.

Thirty-three patients (33/34 = 97%) were dyspnea free on exertion 1 year postoperatively. One patient developed restenosis and dyspnea 1 year after treatment; she refused any retreatment because she had already recurrent medullary carcinoma of thyroid in the superior mediastinum. She had bilateral vocal fold paralysis after thyroidectomy and received postoperative radiation therapy. She continues to live with tracheotomy.

DISCUSSION

In laryngeal stenosis treatment, success with surgery depends on re-epithelialization before scar reformation. Coverage with

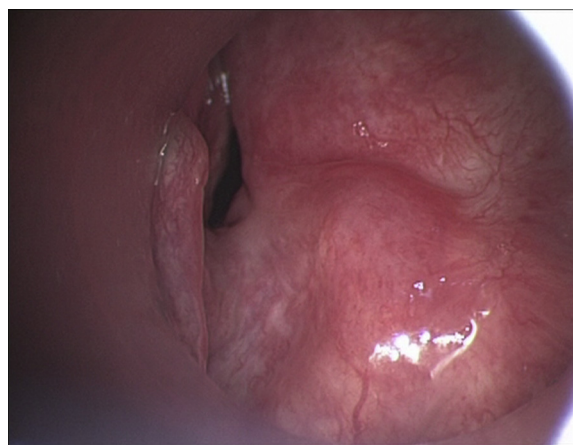


FIGURE 2. A 50-year-old man with bilateral vocal fold paralysis after thyroidectomy. He previously underwent four unsuccessful operations: total arytenoidectomy, revision of total arytenoidectomy, right cordectomy and excision of right false vocal fold, and external suture lateralization of right hemilarynx. He has tracheotomy. He is about to undergo endoscopic right microtrapdoor flap surgery.

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