Journal reading –
Surgical Treatment of Glottic Web

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Journal reading

Surgical Treatment of Glottic Web Using Butterfly Mucosal Flap Technique: Experience on 12 Patients

Surgical Treatment of Glottic Web Using Butterfly Mucosal Flap Technique: Experience on 12 Patients

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Objectives: Many surgical methods have been described for the treatment of glottic web, with very little experience of each. Butterfly mucosal flap technique utilizes superior and inferior mucosal flaps on corresponding surfaces of the web; superior flap is elevated with its base on one vocal fold; and inferior flap is elevated with its base on the other vocal fold. These flaps are sutured to the vocal fold where flap's base is located. This requires four to six microsutures. The disadvantage of this technique is its difficulty. The advantages are single-stage endoscopic outpatient surgery and high success rate.

Methods: This is an individual prospective cohort study. All consecutive 12 cases of glottic web were treated with butterfly mucosal flap technique and followed for at least 1 year postoperatively. Voice Handicap Index (VHI)-30 including physical, functional, emotional, and total scores; acoustic analysis with /a/; aerodynamic measures; and respiratory function tests with a spirometer were determined pre- and postoperatively.

Results: Six patients were male; five were female; and one was male-to-female transsexual. Their ages ranged between 9 and 60 years with a mean of 36. All webs were caused by surgical trauma. All webs were cured with one surgery. The postoperative VHI scores, acoustic analysis results, aerodynamic measures, and respiratory function test results of patients improved significantly postoperatively ($P < 0.05$).

Conclusion: Although technically difficult, butterfly mucosal flap technique is a very successful single-stage endoscopic surgical option for the treatment of glottic webs.

Key Words: Glottic web, congenital anterior, glottis, vocal cords, laryngoscopy, laryngostenosis, laryngeal diseases.

Level of Evidence: 2

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Introduction

- Glottic web is a bridge of **scar tissue** covered superiorly and inferiorly by epithelium between the free edges of true vocal folds at the anterior commissure.

Introduction

- **Can be congenital or acquired.**

- Acquired webs are more commonly observed today than congenital ones

Introduction

- Causes of Acquired Glottic Webs
  - ✓ **Surgical iatrogenic trauma**
  - ✓ External trauma or intubation
  - ✓ Infection(M. Tuberculosis,C. Diphtheriae,B. Cereus)
  - ✓ Reflux (GERD)
  - ✓ Radiation therapy

Introduction

- Causes of congenital Glottic Webs
  - ✓ chromosome 22q11 deletion (velocardiofacial syndrome and DiGeorge syndrome)
  - Submucosal palatal cleft
  - aberrant pulses of medialized internal carotid artery in nasopharynx

Introduction

- After diagnosis of glottic web, it is a sound clinical practice to rule out the possibility of **subglottic stenosis** by **endoscopy** of the airway or **computed tomography scan** of the larynx.

Introduction

- Anterior glottic web is a difficult-to-treat clinical entity in laryngology.

- The main challenge in the treatment of anterior glottic webs has been **the reformation of web after surgery.**

Introduction

- Surgical Treatment of web Categories

✓ Endoscopic vs. Open via Laryngofissure

✓ Single-stage vs. Two-stage procedures

✓ Laser vs. Cold instruments

✓ Use of keel vs. No keel

➢ Endoscopic & Single-Stage techniques offer advantages

Introduction

- Indications for Surgery

✓ Surgery required if:

✓ Airway obstruction

✓ Dysphonia (hoarseness)

✓ Surgery NOT required if:

✗ No symptoms → Observation only

Materials and Methods

- Study Design
  - ✓ Prospective Cohort Study
  - ✓ 12 patients with anterior glottic web
  - ✓ Treatment: Butterfly Mucosal Flap Technique
  - ✓ Study period: 2010 - 2016
  - ✓ Follow-up duration: At least 1 year postoperatively

Materials and Methods

- Patients

✓ Age Range: 9–60 years (Mean: 36 years)

✓ Gender:6 Males,5 Females,1 Male-to-Female Transgender

✓ Cause: All cases were post-surgical trauma

✓ No tracheotomy required pre- or post-op

Materials and Methods

- Cohen Classification System:

Type	Glottic Web Coverage	Cases
Type 1	< 35%	2 cases
Type 2	35–50%	5 cases
Type 3	50–75%	5 cases
Type 4	75–100%	0 cases

- All cases were classified as “thin webs”

Materials and Methods

- Preoperative & Postoperative Evaluations

✓ GRBAS Scale

✓ Voice Handicap Index (VHI)-30

✓ Acoustic analysis

✓ Aerodynamic measures

✓ Pulmonary Function Tests

Surgical Technique

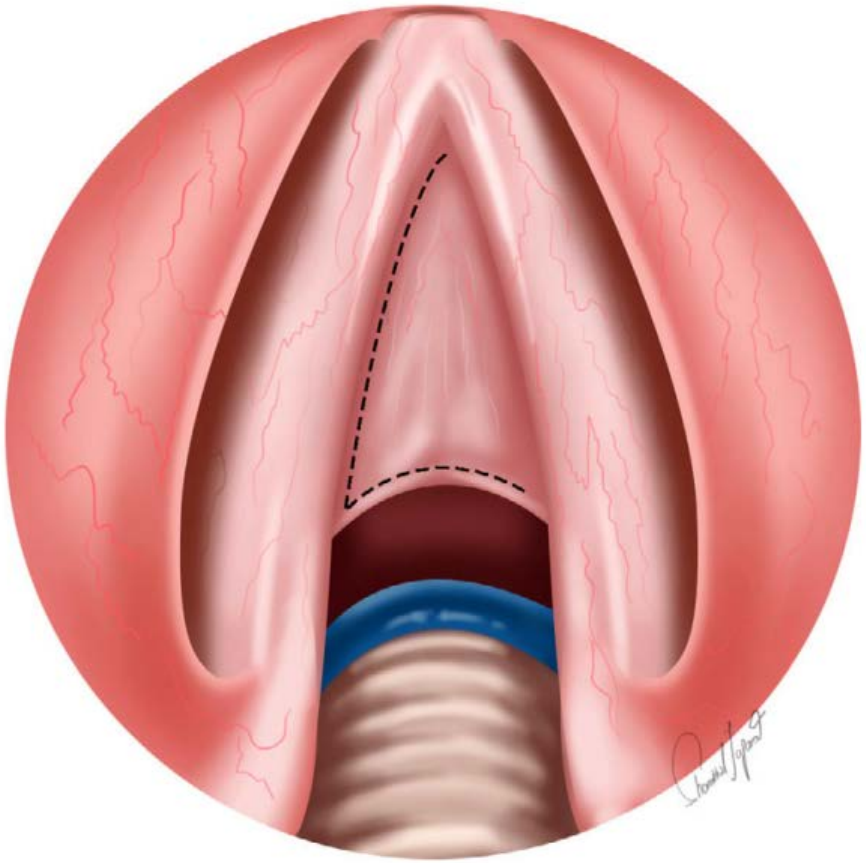

Fig. 1. Incision on the superior surface of web.

Surgical Technique

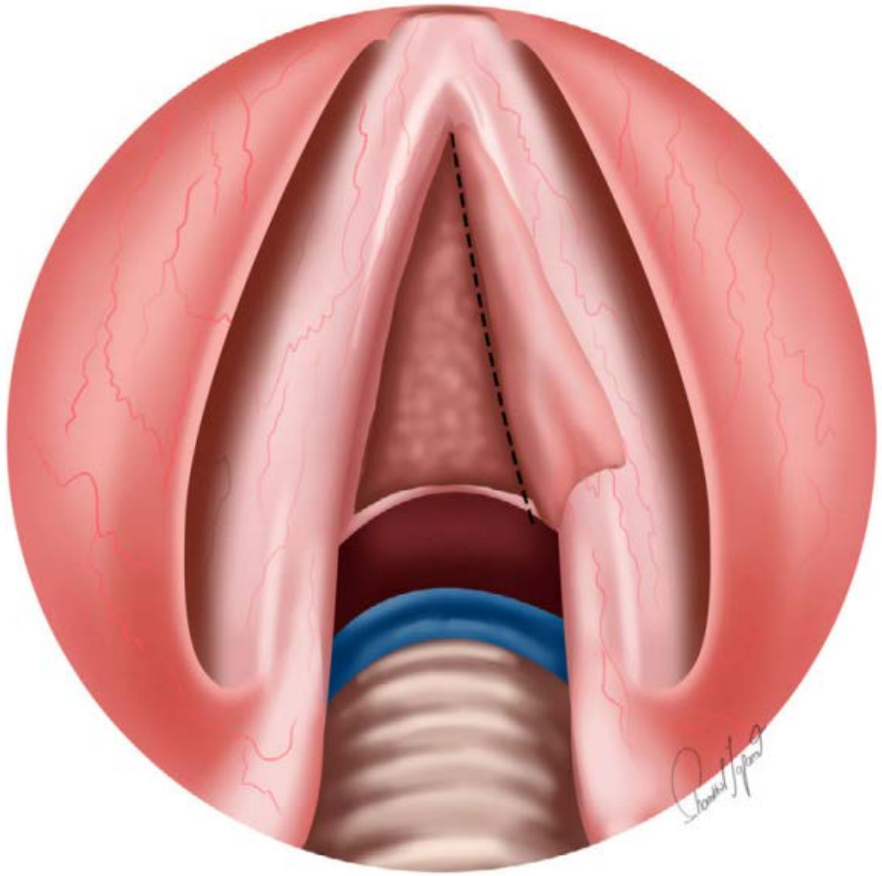

Fig. 2. Superior mucosal flap elevated based on the right vocal fold.

Surgical Technique

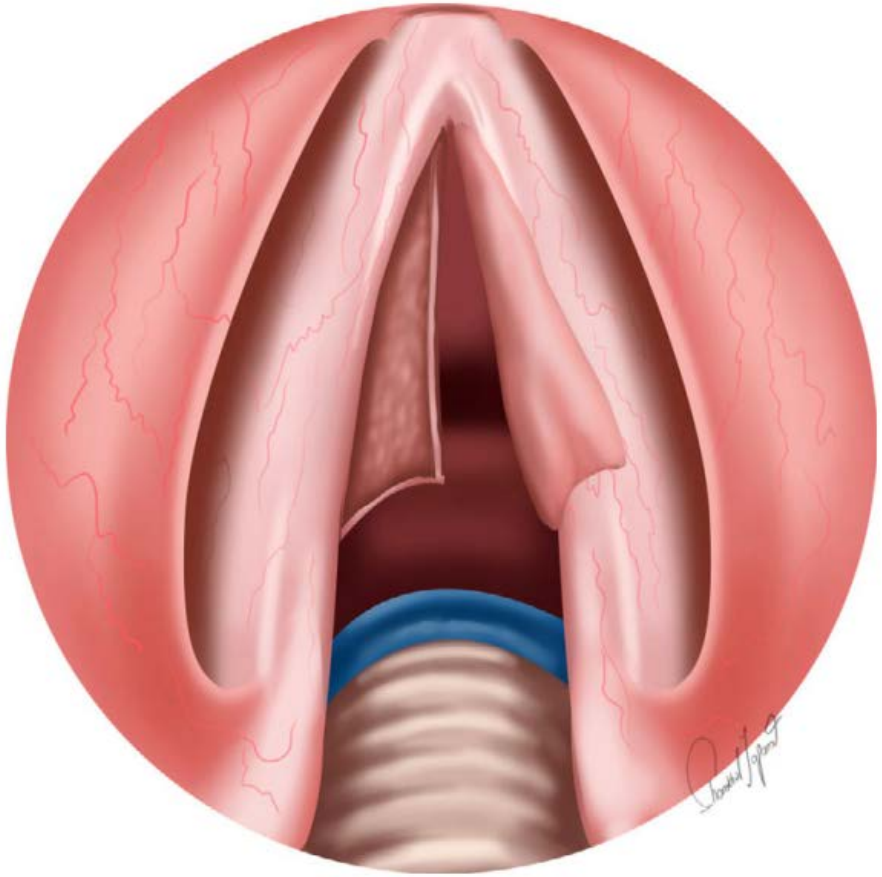

Fig. 3. Inferior mucosal flap developed based on the left vocal fold.

Surgical Technique

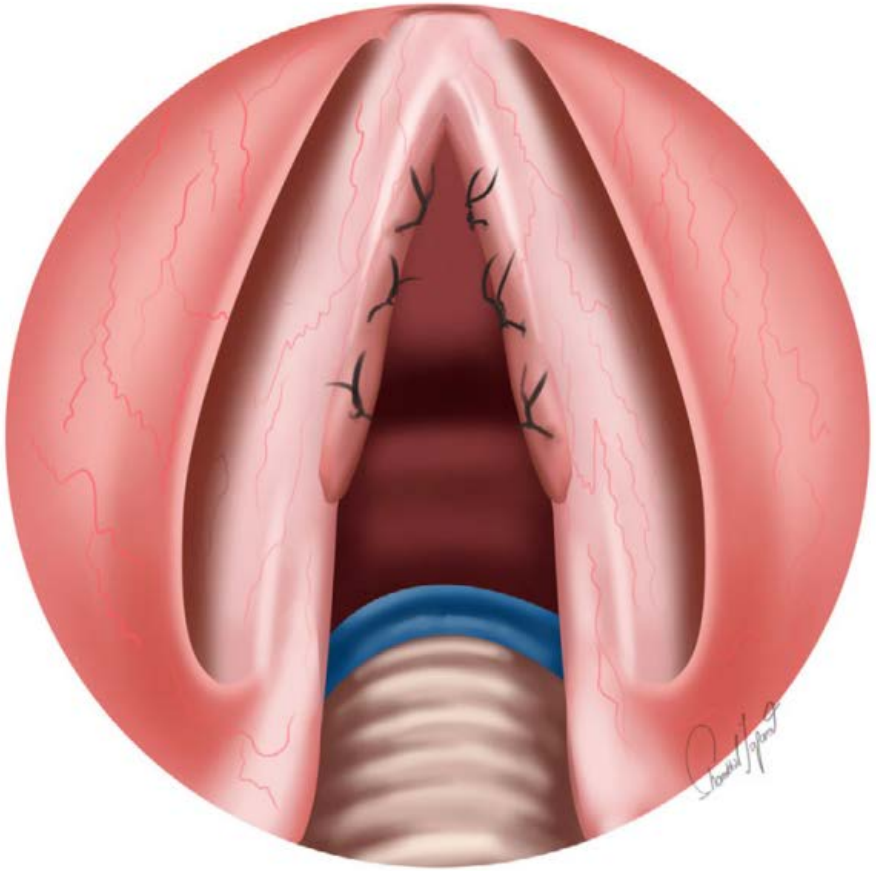

Fig. 4. Superior mucosal flap was sutured to the undersurface of the right vocal fold; inferior mucosal flap was sutured to the superior surface of the left vocal fold.

RESULTS

All parameters were statistically significantly different postoperatively compared to preoperative results (P < 0.05).

TABLE I.
Comparison of Preoperative and Postoperative Acoustic, Aerodynamic, and Spirometric Results of All Web Patients and When Controlled for Web Type (Wilcoxon signed rank test).

Parameter	Preoperative Mean	Postoperative Mean	Statistics	Web Type	Pre-/Postoperative Mean	Statistics
Grade	2.17	0.92	Z = −2.88, *P* = 0.004	Type 1–2	1.86/1	Z = −2.12, *P* = 0.034
				Type 3	2.60/0.80	Z = −2.12, *P* = 0.034
Roughness	2.17	0.92	Z = −2.88, *P* = 0.004	Type 1–2	1.86/1	Z = −2.12, *P* = 0.034
				Type 3	2.60/0.80	Z = −2.12, *P* = 0.034
Breathiness	1.25	0.17	Z = −2.92, *P* = 0.004	Type 1–2	1/0.14	Z = −2.45, *P* = 0.014
				Type 3	1.60/0.20	Z = −1.89, *P* = 0.059
F0	209	171	Z = −2.99, *P* = 0.003	Type 1–2	161/130	Z = −2.37, *P* = 0.018
				Type 3	275/229	Z = −1.75, *P* = 0.080
Jitter %	4.64	2.77	Z = −2.83, *P* = 0.005	Type 1–2	3.61/2.64	Z = −2.20, *P* = 0.028
				Type 3	6.09/2.95	Z = −1.75, *P* = 0.080
Shimmer %	7.38	3.95	Z = −2.83, *P* = 0.005	Type 1–2	5.11/3.60	Z = −2.20, *P* = 0.028
				Type 3	10.56/4.44	Z = −1.75, *P* = 0.080
NHR	0.48	0.19	Z = −2.75, *P* = 0.006	Type 1–2	0.35/0.18	Z = 2.03, *P* = 0.043
				Type 3	0.67/0.21	Z = −1.75, *P* = 0.080
VHI physical	25	15	Z=−2.83, p=0.005	Type 1–2	21/15	Z = −1.86, *P* = 0.063
				Type 3	31/15	Z = −2.03, *P* = 0.042
VHI functional	26	15	Z = −2.83, *P* = 0.005	Type 1–2	21/14	Z = −1.86, *P* = 0.063
				Type 3	32/16	Z = −2.03, *P* = 0.042
VHI emotional	26	14	Z = −2.81, *P* = 0.005	Type 1–2	22/13	Z = −2.00, *P* = 0.046
				Type 3	31/15	Z = −2.03, *P* = 0.042
VHI total	77	45	Z = −2.82, *P* = 0.005	Type 1–2	64/44	Z = −1.86, *P* = 0.063
				Type 3	94/46	Z = −2.02, *P* = 0.043
MPT	10.4	16.3	Z = −2.85, *P* = 0.004	Type 1–2	11.7/17.6	Z = −2.21, *P* = 0.027
				Type 3	8.6/14.6	Z = −1.75, *P* = 0.080
Mean airflow	0.20	0.13	Z = −2.83, *P* = 0.005	Type 1–2	0.19/0.13	Z = −1.87, *P* = 0.062

RESULTS

All parameters were statistically significantly different postoperatively compared to preoperative results (P < 0.05).

				Type 3	0.22/0.12	Z = −2.02, *P* = 0.043
Mean resistance	51.0	21.9	Z = −2.85, *P* = 0.004	Type 1–2	35.7/25.6	Z = −2.00, *P* = 0.046
				Type 3	72.4/16.8	Z = −2.02, *P* = 0.043
Mean power	0.06	0.09	Z = −2.85, *P* = 0.004	Type 1–2	0.07/0.09	Z = −2.01, *P* = 0.044
				Type 3	0.05/0.10	Z = −2.03, *P* = 0.042
Mean efficiency	49.9	82.5	Z = −2.83, *P* = 0.005	Type 1–2	61.9/79.6	Z = −1.86, *P* = 0.063
				Type 3	33.2/86.6	Z = −2.03, *P* = 0.042
Mean pressure	6.82	4.86	Z = −2.82, *P* = 0.005	Type 1–2	6.69/5.70	Z = −1.86, *P* = 0.063
				Type 3	7.00/3.69	Z = −2.02, *P* = 0.043
FVC	3.87	4.67	Z = −2.85, *P* = 0.004	Type 1–2	4.26/4.79	Z = −1.99, *P* = 0.046
				Type 3	3.33/4.50	Z = −2.02, *P* = 0.043
FEV1	2.29	2.78	Z = −2.85, *P* = 0.004	Type 1–2	2.50/2.76	Z = −1.99, *P* = 0.046
				Type 3	1.99/2.81	Z = −2.02, *P* = 0.043
PEF	4.81	5.99	Z = −2.83, *P* = 0.005	Type 1–2	5.23/6.05	Z = −1.86, *P* = 0.063
				Type 3	4.23/5.90	Z = −2.02, *P* = 0.043
FIC	3.17	3.93	Z = −3.06, *P* = 0.002	Type 1–2	3.61/4.23	Z = −2.37, *P* = 0.018
				Type 3	2.57/3.52	Z = −2.02, *P* = 0.043
FIF50	1.19	1.86	Z = −2.85, *P* = 0.004	Type 1–2	1.43/1.91	Z = −1.99, *P* = 0.046
				Type 3	0.86/1.79	Z = −2.02, *P* = 0.043
FIV1	1.55	2.22	Z = −2.99, *P* = 0.003	Type 1–2	1.81/2.23	Z = −2.21, *P* = 0.027
				Type 3	1.17/2.20	Z = −2.02, *P* = 0.043

F0 = Fundamental frequency; FEV1 = forced expiratory volume in 1 second; FIC = forced inspiratory capacity; FIF = forced inspiratory flow; FIV1 = forced inspiratory volume in 1 second; FVC = forced vital capacity; NHR = noise-to-harmonic ratio; PEF = peak expiratory flow; VHI = Voice Handicap Index; MPT = Maximum phonation time.

DISCUSSION

- Glottic web remains a scar tissue even after surgery.
- Normal voice restoration is not possible , but significant voice improvement is observed.
- Statistically significant improvement in both subjective (VHI-30) and objective voice parameters (P < 0.05).

DISCUSSION

- Traditional excision methods (cold instrument or CO_2 laser) should be avoided due to high recurrence and worse scarring.

DISCUSSION

- Glottic web surgery is contraindicated in cases of active HPV infection.

- However, with the butterfly mucosal flap technique, this contraindication is not valid because there is no stent and everything happens within glottis.

DISCUSSION

- Butterfly Mucosal Flap Technique – Key Advantages

✓ **Prevents web recurrence** by ensuring full mucosal coverage.

✓ **Preserves vocal fold structure**, reducing secondary injuries.

✓ No keel required (**HPV -safe**)

✓ Single-stage endoscopic outpatient surgery, **minimally invasive**

DISCUSSION

- Limitations of the Butterfly Mucosal Flap

  Technique

- ✓ Not suitable for thick webs (>1 cm thickness)
- ✓ High Technical Difficulty

CONCLUSION

- Although technically difficult, **butterfly mucosal flap technique is a very successful single -stage endoscopic surgical option** for the treatment of glottic webs.

Case presentation

Patient profile

- 姓名:紀o希
- 性別:女(2023/08 跨性別手術)
- 年齡:28歲
- 職業: PM
- Smoking(-), Alcohol (+,每周喝)

Disease History

- s/p transgerder surgery at CGMH, 2023/8
- s/p endoscopic glottoplasty on 2024/06/11
- s/p glottoplasty (bi - pedicle flap reconstruction) on 2025/01/25

- 病歷號: 1555282　　姓名: 紀睿希
  生　日: 1997-01-22 (27y)　　性別: 女
  開單科: 耳鼻喉部 / 王棨德
  檢查日期: 2024-11-14 時間: 16:07:34
  檢查項目: Nasopharyngolaryngoscopy

  [Impression]

  開單日期：2024-11-14

  耳鼻喉內視鏡 檢查報告單

  Endoscope：Olympus/204190241/白

  [臨床檢查發現或診斷]
  anterior web formation, granulation persisted, stitches in place, VF hyperemia, sputum　　(+)

Treatment course

- Steroid injection on 09/05 and 10/03

- s/p glottoplasty (bi-pedicle flap reconstruction) on 2025/01/25

術前診斷	anterior vocal fold web
術後診斷	Ditto, operated
手術內容	1.Laryngeal plasty - complicated
手術發現	ant glottic web divided and right inf. based flap sutured with 5-0 maxon *3
手術時間	2 小時 0 分鐘
病理檢體	無
手術程序	* pt' in supine position, ETGA * apply supporter device * laryngeal engagement with rigid laryngoscope and fixed with supporter and external compression, (Laryngeal exposure: Grade 3) * apply microscope at 400mm working distance and adequate magnification * subepithelial infiltration of diluted bosmin solution * cordotomy along R VF edge , remove subepithelial grabular fibrotic tissue * Right inf. based flap was used to cover trhe raw surface * Hemostasis with bosmin cotton balls; dry the wound with cotton ball * suture the raw surface with 5-0 maxon(total 3 stitches) * artiss applied to raw surface * xylocaine local spray * remove the laryngoscope and supporter device * whole procedure finished smoothly
手術傷口	Classification of operative wound: Clean-contaminated, Trauma: No, Skin Suture: No

Thank you!