Paper reading

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Clinical effect of CO_2 laser resection of the epiglottic cyst under micro-laryngoscope suspension

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Epiglottic cyst

1. Cyst under epiglottic mucosa
2. Caused by inflammation, mechanical stimulation or trauma
3. Incidence in benign laryngeal masses: 4.3–6.1%
4. Cysts usually occur on the lingual surface, vallecula and edge of the epiglottis

Epiglottic cyst

1. Small cyst:
   - Asymptomatic

1. Large cyst:
   - Foreign body sensation
   - Throat obstruction
   - Pain or discomfort (if infected)
   - Severe cases → dyspnea

Epiglottic cyst

1. Primary treatment: **surgical resection**.
2. Goal: complete removal, good hemostasis and minimal damage to the surrounding tissue
3. Modern Surgical Techniques:
   - High-frequency electrotome
   - Microwave therapy
   - Radiofrequency
   - Uncovering method
   - Low-temperature plasma
   - **CO_2 laser resection**(**most widely used in recent years**)

- Study objective:
  compared two techniques
  (CO_2 resection v.s. High frequency electrotome)
  under suspension laryngoscopy for epiglottic cysts.

General data collection

1. Sample size: 80 patients
2. Period:2018/01-2020/12
3. Mean age: 46.1 ± 13.1 years
4. Cyst size range:
   0.3 × 0.5 × 0.5 cm →
   1.4 × 1.5 × 2.0 cm

Table 1. Comparison of general data.

Item	CO_2 laser ($n = 44$)	High-frequency electrotome ($n = 36$)	χ^2	p
Gender				
Male	15	12	0.6712	0.4126
female	29	24		
Age				
<46 years old	22	14	0.1506	0.6980
≥46 years old	22	22		
Course of disease				
<2.5 years	36	28	0.2020	0.6531
≥2.5 years	8	8		
Onset condition				
Initial	39	27	2.550	0.1103
Recurrent	5	9		
Cyst location				
Epiglottic vallecula	9	8	0.1652	0.9207
Epiglottis lingual surface	24	18		
Epiglottis edge	11	10		
Quantity				
Single	35	26	0.5864	0.4438
Multiple	9	10		

Inclusion & Exclusion criteria

1. Inclusion criteria
   - Mass were confirmed by laryngoscopy
   - Benign lesions by histopathological examination

1. Exclusion criteria
   - Patients with pacemakers
   - Pregnant and lactating women
   - Patients with a recent history of herpes virus infection
   - Patients with cardiopulmonary insufficiency

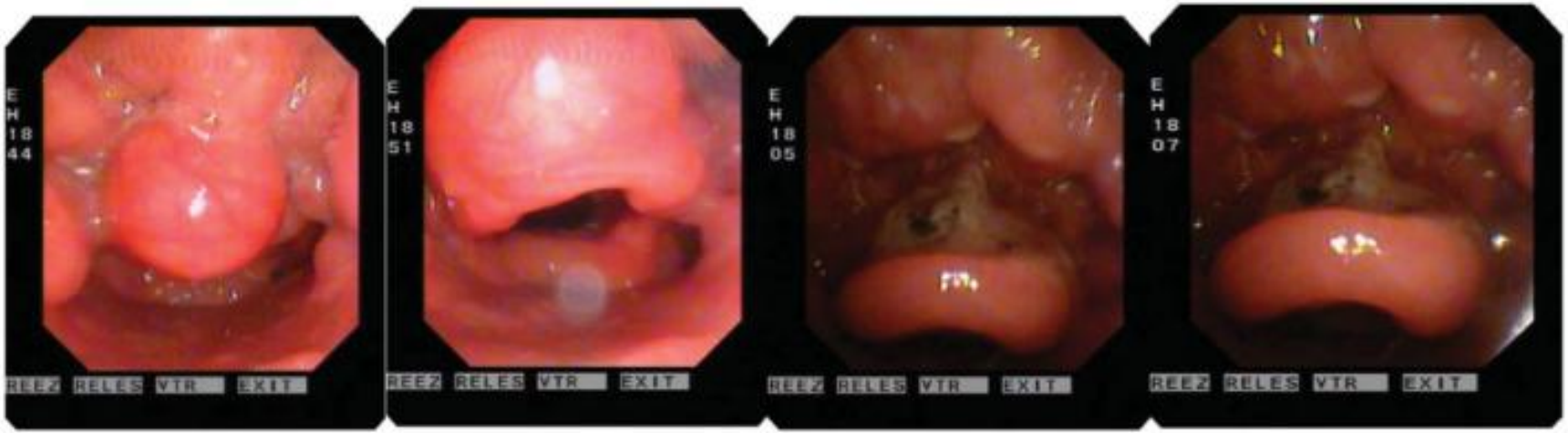
Observation indices

1. Pre-op : the results of preoperative laryngoscopy
2. Intraoperative: operation time, bleeding volume, number of cyst ruptures
3. Post-op : VAS pain score (Day 1) , duration of sore throat, regression of wound redness/swelling
4. Follow-up: mucosa healing (1 month), curative effect (3 month)
5. Complication & recurrence within 1 year recorded

Statistical Analysis

1. Software: SPSS 20.0
2. Data type: normally distributed
3. Tests used:
   - t-test for measurement data (mean ± SD)
   - χ^2 test for categorical data (%)
1. Significance level: $p < 0.05$

Results of laryngoscopy



Results of laryngoscopy

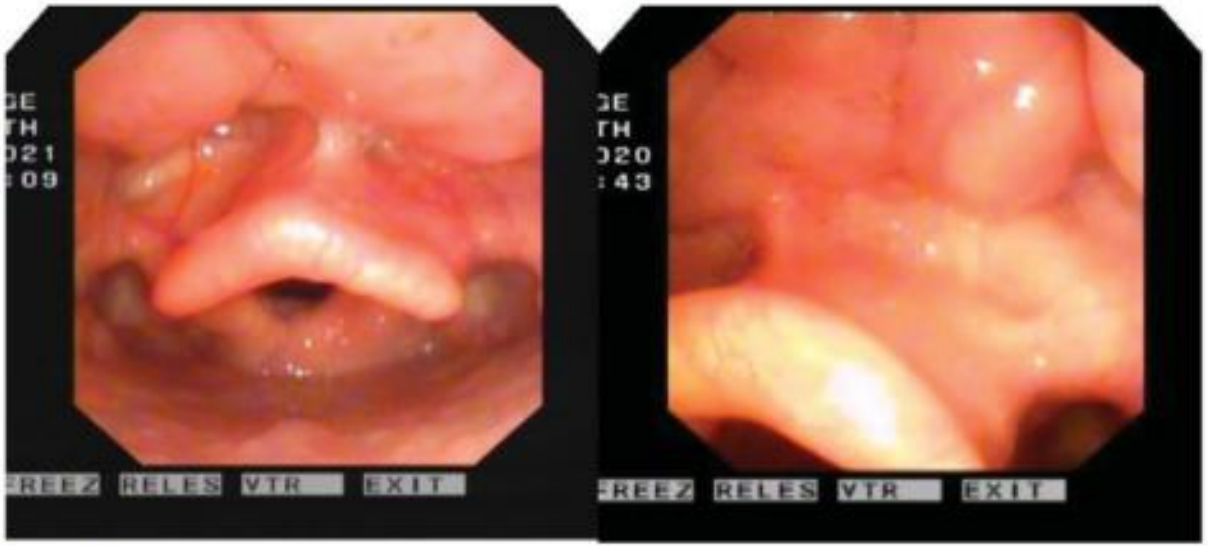


Figure 2. One month after the operation, the mucosa of the epiglottis lingual surface returned to normal.

Comparison

Table 2. Comparison of intraoperative conditions.

Group	Operative duration ($\bar{X} \pm s$ min)	Blood loss ($\bar{X} \pm s$ mL)	Number of ruptured cysts during operation (n)	
			With rupture	Without rupture
CO_2 laser group	15.37 ± 2.16	3.23 ± 0.43	3	41
High-frequency electrotome group	21.68 ± 4.33	8.21 ± 1.02	8	28
t/χ^2	8.416	29.24	3.926	
p value	<0.0001	<0.0001	0.0465	

Table 3. Comparison of postoperative conditions.

Group	VAS score	Duration of sore throat ($\bar{X} \pm s$ d)	Time of wound redness and swelling regression ($\bar{X} \pm s$ d)	Time of tunica albuginea falling off ($\bar{X} \pm s$ d)
CO_2 laser group	3.15 ± 1.26	2.95 ± 0.33	2.56 ± 0.45	24.83 ± 3.57
High-frequency electrotome group	3.39 ± 1.12	4.07 ± 0.38	3.74 ± 0.41	27.01 ± 3.19
t/χ^2	0.4564	13.91	11.93	2.800
p value	0.6494	<0.0001	<0.0001	0.0065

Comparison

Table 4. Comparison of therapeutic effects.

Group	Markedly effective (n)	Effective (n)	Ineffective (n)	Number of recurrences (n)	Total effective rate (%)	Recurrence rate (%)
CO_2 laser group	40	3	1	1	97.73	2.27
High-frequency electrotome group	28	3	3	2	91.18	8.82
χ^2					0.1490	0.6756
p value					0.6995	0.4111

Table 5. Incidence of complications.

Group	Cicatricial contracture of epiglottis (n (%))	Conglutination of vocal cords (n (%))	Active hemorrhage (n (%))	Deformation and defect of epiglottic cartilage (n (%))	Total incidence (n (%))
CO_2 laser group	3 (6.82)	1 (2.27)	1 (2.27)	0 (0.00)	5 (11.36)
High- frequency electrotome group	8 (22.22)	0 (0.00)	1 (2.78)	0 (0.00)	9 (25.00)
χ^2	3.926	0.8285	0.0207	–	2.550
p value	0.0465	0.3627	0.8855	–	0.1103

CO_2 laser resection

➢ Advantages:

- **More accurate laser resection**
- Minimal tissue injury
- Rapid recovery & excellent outcomes
- Complete cyst wall removal → low recurrence
- **Better hemostasis**
- Clearer vision

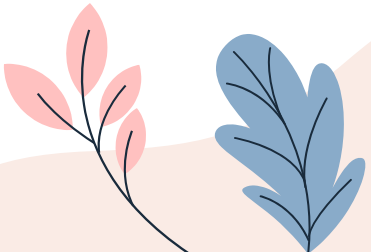
Limitations of electrotome

1. High temperature leads the cyst wall be **burned or damaged**, cyst fluid flowing out cyst wall collapse, and cyst boundary uncleared.
2. Blade is easy to adhere to the surrounding tissue, **causing bleeding**.
3. **Poor visual field** in narrow space.

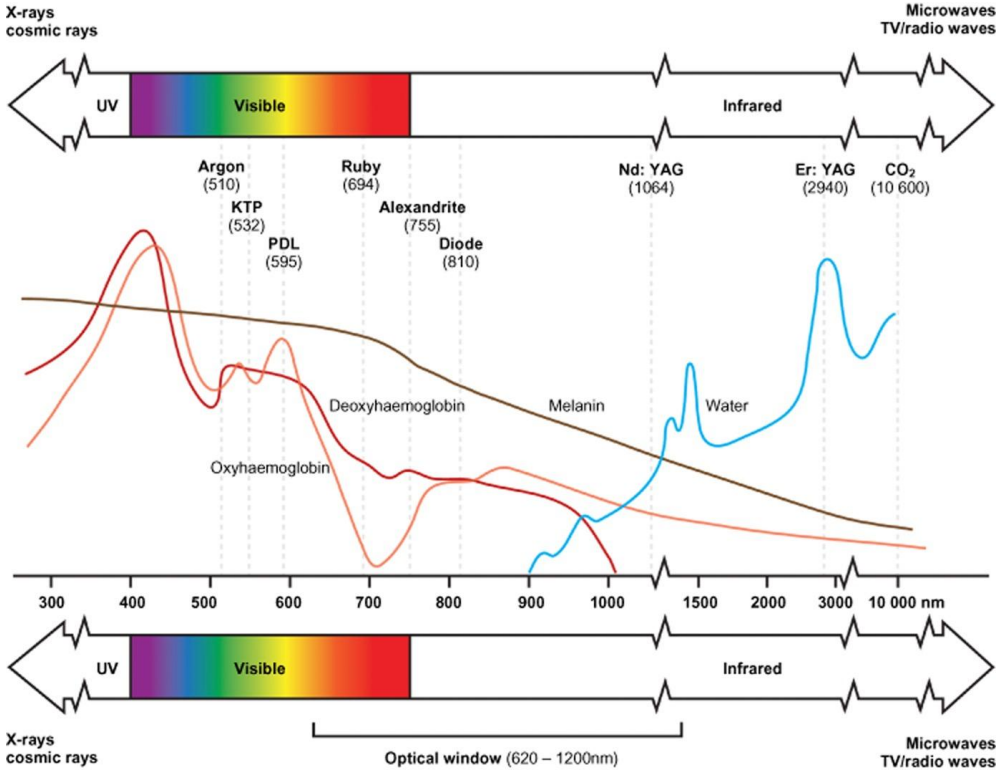
	CO_2 laser	High-Frequency Electrotome	Significance
Operation time	較短	較長	✓有(P<0.05)
Blood loss	較少	較多	✓有
Cyst rupture	較少	較多	✓有
Sore throat duration	較短	較長	✓有
Wound regression	較快	較慢	✓有

	CO_2 laser	High-Frequency Electrotome	Significance
Total effective rate	97.7%	91.2%	沒有顯著差異
Recurrence rate	2.3%	8.8%	沒有顯著差異
Cicatricial contracture of epiglottis	發生率較低	發生率較高	✓有
Conglutination of vocal cords	2.3%	0%	沒有顯著差異
Active hemorrhage	2.3%	2.3%	沒有顯著差異
Deformation and defect of epiglottic cartilage	無	無	–

Discussion: Medical lasers



Laser Wavelengths



Ref: https://astanzalaser.com/understanding-the-differences-between-erbiumyag-and-co2-lasers/

CO_2 laser

1. Wavelength: 10,600 nm (infrared)
2. Highly absorbed by **water**
3. Advantages: **High precision, minimal bleeding, excellent visualization under microscope, reduced postoperative edema and scarring**
4. Applications: Vocal fold leukoplakia, recurrent respiratory papillomatosis(RRP), benign vocal fold lesions, Reinke edema, and laryngeal lesions outside of the vocal fold.

Ref: Feasibility and Associated Limitations of Office-Based Laryngeal Surgery Using Carbon Dioxide Lasers

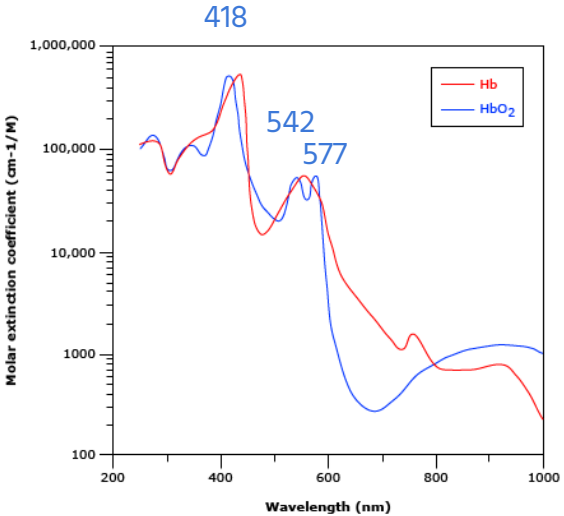
KTP laser(532 nm)

1. Generated by "frequency doubling" the **Nd:YAG laser (1064 nm) through a KTP crystal.**
2. Photoangiolytic, **targeting oxyhemoglobin** for selective coagulation of microvasculature. Preferred for vascular lesions.
3. Applications: recurrent respiratory papillomatosis(RRP), leukoplakia, and dysplasia, and other benign laryngeal lesions, such as polyps and granulomas.
4. Effective, safe, and well-tolerated, with high rates of disease control and low complication rates.

Ref:Office-Based 532-Nanometer Pulsed Potassium-Titanyl-Phosphate Laser Procedures in Laryngology

PDL(Pulsed-dye laser)(585 nm)

1. Wavelength: 585–595 nm（yellow light）
2. Highly absorbed by hemoglobin
3. Applications: recurrent respiratory papillomatosis(RRP), vascular lesions (such as ectasia and varices), vocal fold granulomas, Reinke's edema.



Ref:Office-Based Pulsed-Dye Laser Surgery for Laryngeal Lesions: A Retrospective Review

Er:YAG laser(2940 nm)

1. Strong absorption by **water**.
2. Applications: vocal fold surgery, stapedotomy, snoring, wart removal.
3. Advantages:
   - Precise ablation with minimal thermal injury.
   - Reduced healing time.

Ref:Erbium: yttrium-aluminum-garnet laser stapedotomy--a safe technique, Use of a microsecond Er:YAG laser in laryngeal surgery reduces collateral thermal injury in comparison to superpulsed CO2 laser

Comparison

	KTP(532nm)	CO_2(10600nm)
作用目標	氧化血紅素	水
熱效應	熱擴散淺、破壞層薄，組織保留較佳	熱作用集中但汽化深度較深，切割精準但破壞範圍稍廣
止血效果	因血管凝固明顯，**止血效果優、出血少**	切割時可同步封閉微血管，但止血力稍弱於 KTP
操作彈性	可光纖傳導，透過內視鏡靈活操作	需顯微鏡直視、角度受限
功能保留	**保留正常黏膜多**，術後語音功能較佳	切除完整但黏膜損失多，語音恢復取決於切除範圍

Ref:Thermal Effects of CO2, KTP, and Blue Lasers with a Flexible Fiber Delivery System on Vocal Folds,https://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0209691&utm_source=chatgpt.com

Thanks

Thank you for your attention.