

# Role of Laser Therapy in Laryngeal Cancer



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# Treatment for Supraglottic Ca

- **History:** Total Laryngectomy was routine until early 50's, when XRT was developed
- Ogura and Som developed the one-stage supra-glottic laryngectomy in 1958
- → involves resection of supra-glottic area; including the pre-epiglottic space, epiglottis, upper  $\frac{1}{2}$  of thyroid cartilage through the plane of ventricles and the hyoid bone

# Treatment for Supraglottic Ca

- Concept of supra-glottic laryngectomy was conceived based on embryologic principles
- Supra-glottic structures develop from branchial arches 3 and 4, whereas glottic and sub-glottic develop from 6 th arch
- Independent lymphatic systems

# Evolution of Supra-Glottic Laryngectomy

- Many modifications since original description
- **Partial Laryngopharyngectomy** by Ogura
- $\frac{3}{4}$  **Laryngectomy** by Dedo in which portions of the glottis are resected

# Management of Primary

- Controversial with various opinions- obviously no single **correct** approach
- T1 tumors, associated with overall cure rates of 75%, with surgery or radiation
- → take into account site, patient factors such as age, medical condition
- Consider saving XRT for possible second primaries (20-30%)

# Management of Primary

- Traditional approach would be laryngectomy with pre or post-op XRT
- T2 tumors may be resectable endoscopically or with a Supra-Glottic laryngectomy
- Consider patient factors, contraindications
- External radiation alone is another option

# Management of Primary

- More recent trend toward organ preservation has led to various chemo-xrt protocols, reporting at least equal loco-regional control rates and possibly marginally improved survival
- Are we always sparing a functional organ?

# Treatment for Glottic Ca

- **History:** first documented tracheostomy for carcinoma was performed by Trousseau in 1835
- Buck performed the first thyrotomy to remove a laryngeal Ca in 1851
- In 1873, Billroth performed the first laryngectomy
- In 1878, Billroth performed the first vertical hemilaryngectomy



# Treatment of Primary

- T1- longstanding debate between surgery & xrt
- 80-90% cure rate for either
- Traditional argument in favor of xrt was “better voice”?
- Arguments in favor of endoscopic resection with or without a laser include lower cost, immediate definitive treatment, less side effects and saving xrt

# Treatment of Primary

- T1-laryngofissure with cordectomy is another option, but rarely indicated today with endoscopic techniques
- Hemilaryngectomy- indicated for ant commissure involvement; if surgery is the chosen method of treatment
- Extended Hemilaryngectomy- if arytenoid is involved. Reconstruct with muscle flaps to prevent aspiration and breathy voice

# Treatment of Primary

- T2- Standard treatment is XRT
- Some would consider a hemilaryngectomy for lesions demonstrating minimal supra-glottic extension to the false cord
- A hemilaryngectomy could be performed if there is less than 1 cm of sub-glottic extension anteriorly or 0.5 cm posteriorly; because of risk of extra-laryngeal spread

# Treatment of Primary

- T3- conventional treatment is total laryngectomy with pre or post op xrt
- Chemo-xrt for organ preservation is becoming more accepted
- \*Pearson- near-total laryngectomy
- \* Steiner- endoscopic laser resection

# Glottic Cancer- Treatment of Primary

- T4- Early lesions with minimal cartilage invasion can be treated with chemo-xrt in an attempt to preserve the larynx
- Advanced lesions are treated with total laryngectomy and post-op xrt

# Sub-Glottic Cancer

- Advanced at time of diagnosis; >50% are T3 or T4
- Primary treatment usually requires a total laryngectomy
- >50% 2 yr mortality in many series
- High risk of stomal recurrence due to pos. tracheal margin and/or mediastinal node involvement

The background of the slide features a large, semi-transparent watermark of the University of Alberta seal. The seal is circular and contains a central shield with a wavy line above a stylized tree. The text 'UNIVERSITY OF ALBERTA' is written around the top inner edge of the seal, and 'QUAECCUMQUE' is written along the bottom inner edge. A small maple leaf is positioned to the left of the shield.

# Role of LASER in Laryngeal Ca

# Endoscopic Laser

- Operating microscope, 1950's
- Microsuspension laryngoscopy, 1960's
- CO2 laser for endolaryngeal surgery, 1970's



# History of Laser

- 1970** Jako & Strong ( Boston)
- 1975** 1<sup>ST</sup> Successful report in Rx Cancer
- 1979** Steiner( 1<sup>st</sup> step)
- 1980** More for RX RLP
- 1985** Start RX CA
- Now** Many Center

# Endoscopic Laser

- **ADVANTAGES:**
  - No trach
  - Shorter OR time
  - Decreased P-C fistula
  - No neck incisions
  - Earlier swallow

# Endoscopic Laser

- **DISADVANTAGES:**
  - Specialized equipment
  - Surgeon inexperience
  - Prolonged healing time
  - Staged neck dissection

# Endoscopic Laser

- Indications:

- T1/T2 Suprahyoid epiglottitis
- Aryepiglottic fold
- Vestibular fold
- Minimal preepiglottic space involvement

# Endoscopic Laser

- Contraindications:

- T4
- Paraglottic space involvement

- Relative Contraindications:

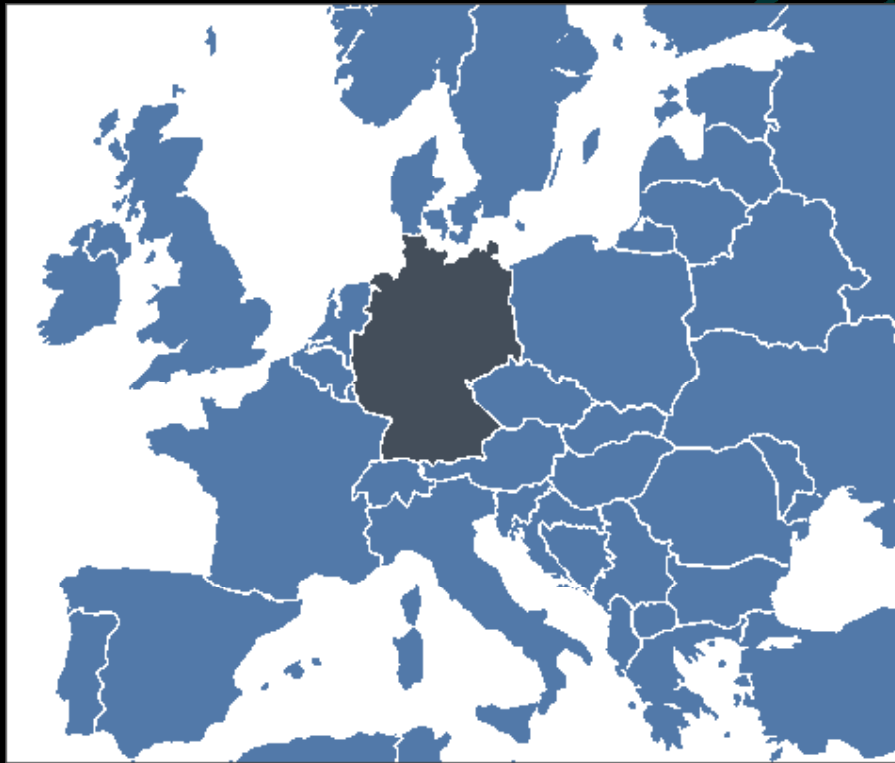
- T3
- Infrahyoid epiglottis
- upper false vocal cord
- Extensive preepiglottic space involvement

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Kopf- und Halschirurgie





## Germany



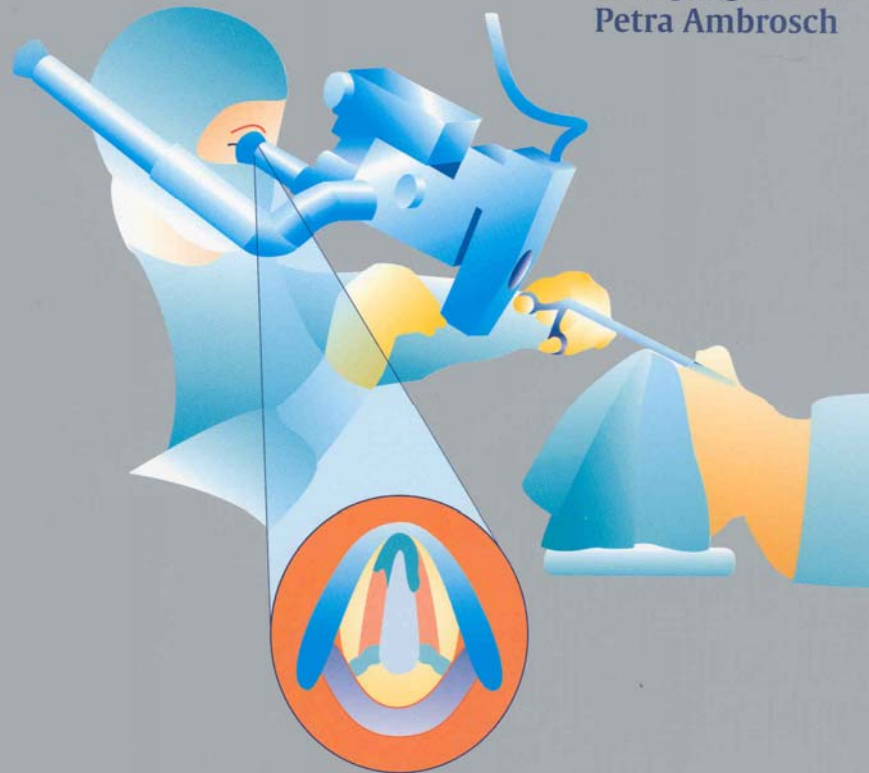




# Endoscopic Laser Surgery of the Upper Aerodigestive Tract

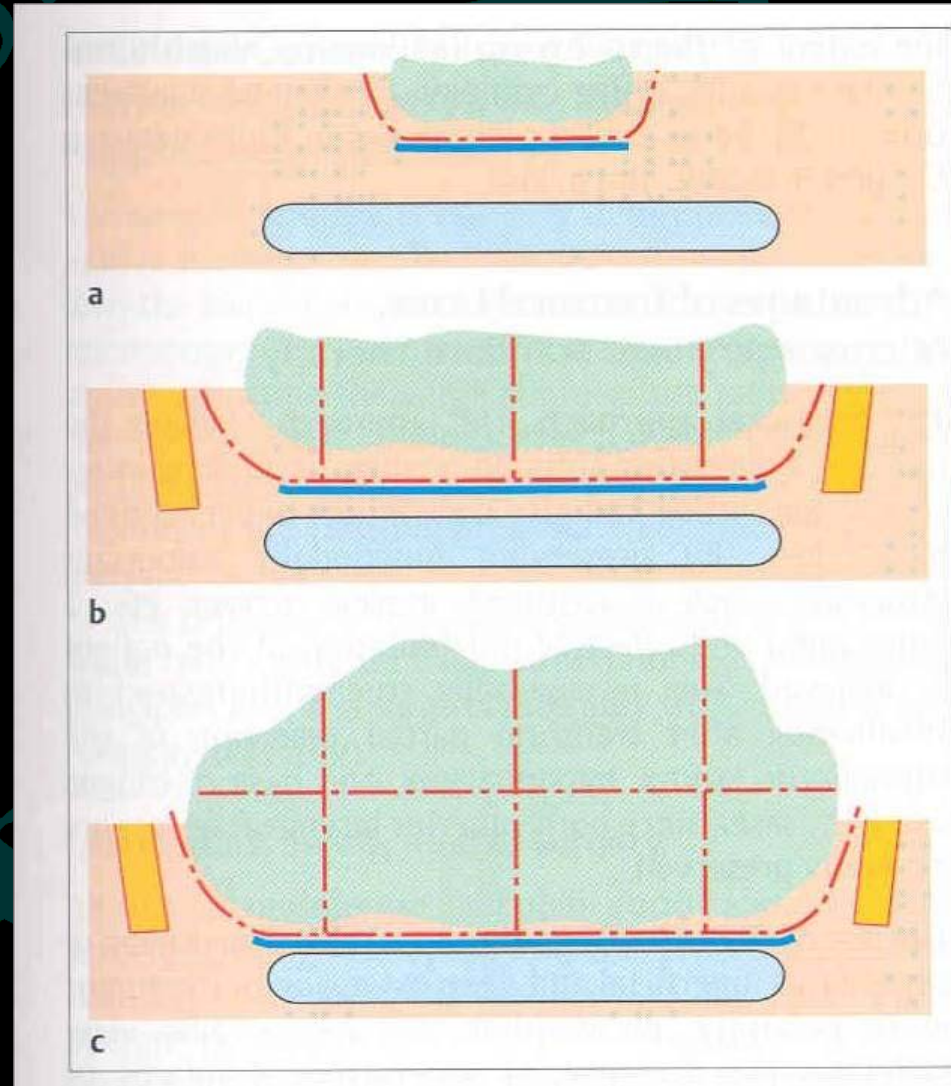
With Special Emphasis on Cancer Surgery

Wolfgang Steiner  
Petra Ambrosch

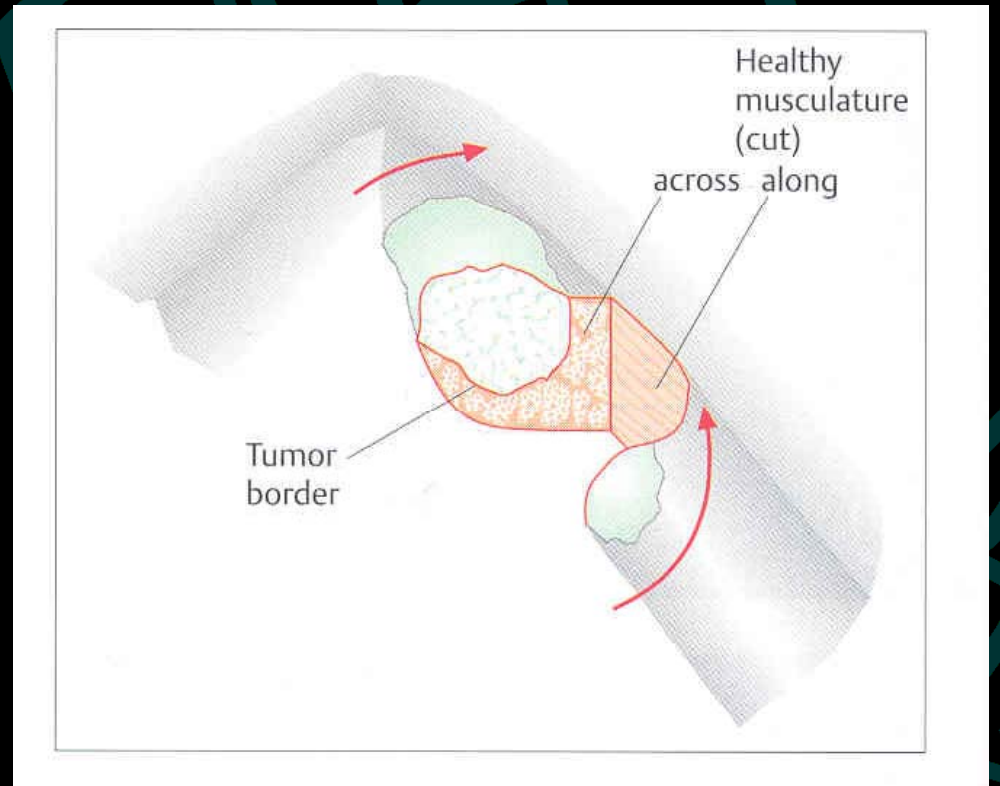
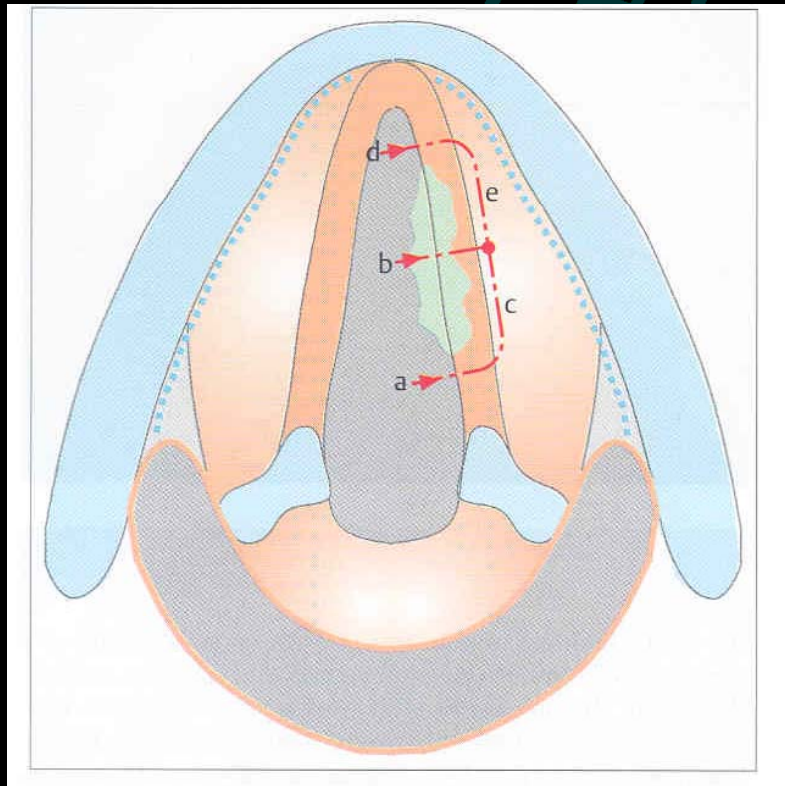


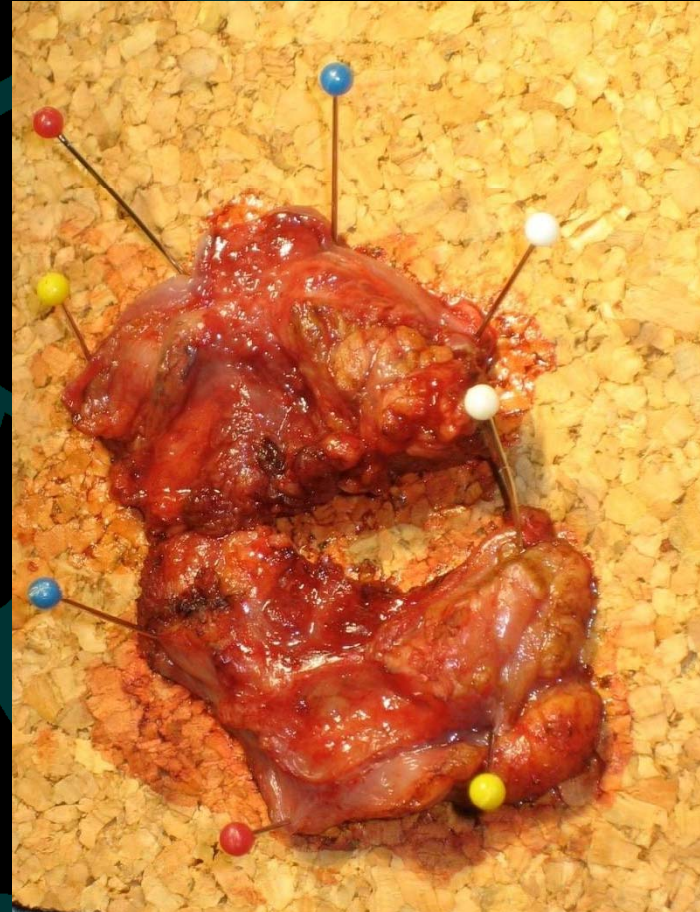
 Thieme

# The Basics



# The Basics



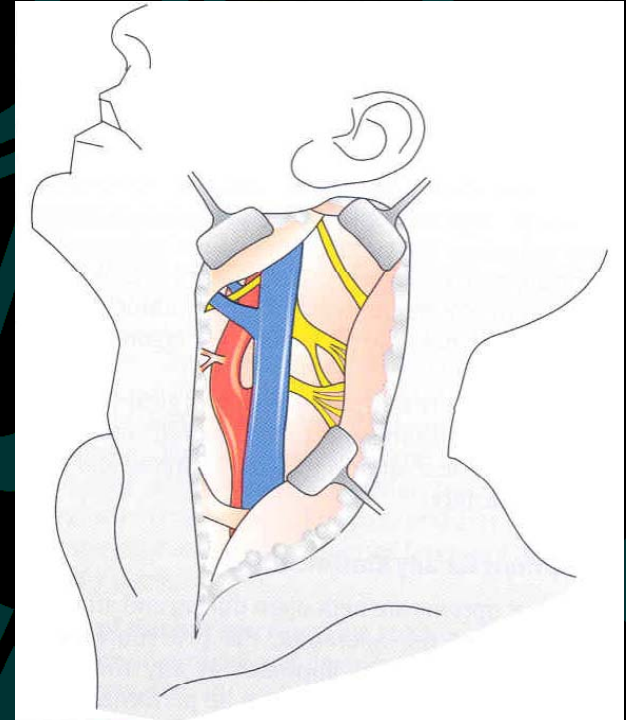


# To Freeze or not to Freeze ??

- Frozen sections  
Reassurance  
No certainty
- Literature: do it
- Reality: your choice

# Neck Dissection Timing

- N+: 4-8d
- N0: up to 4-6wks
- Path report back  
Possible revision
- Swelling decreased
- Decr chance of perforation



# Post-op care

- Repeated exams  
6-8 wks post-op  
q 3 mo  
? routine OR +/- bx
- Voice rest
- No abx or steroids
- No smoking

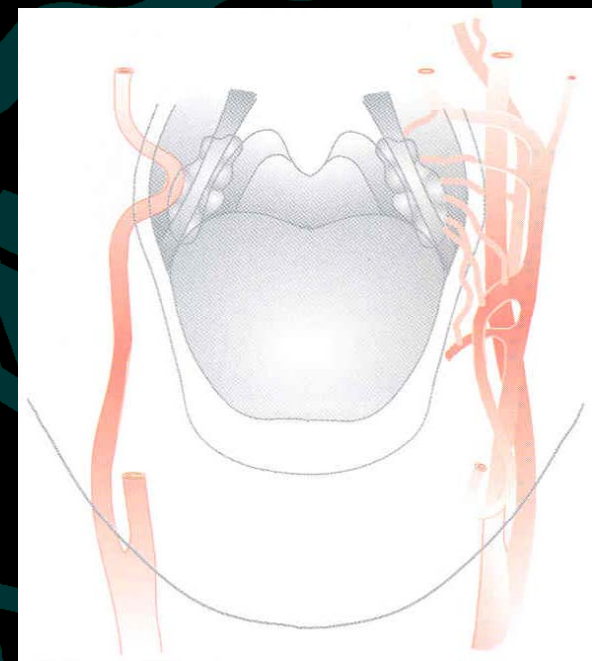
# Post-op XRT indications

- Primary:
  - Only if incomplete resection
  - T stage no role
- Neck:
  - N2-3 (path)
  - Extracapsular extension
  - Angioinvasion



# Complications: bleeding

- Anterolat to arytenoid
- Superolat to upper edge thyroid



# Airway Fire

Combustible

Fuel

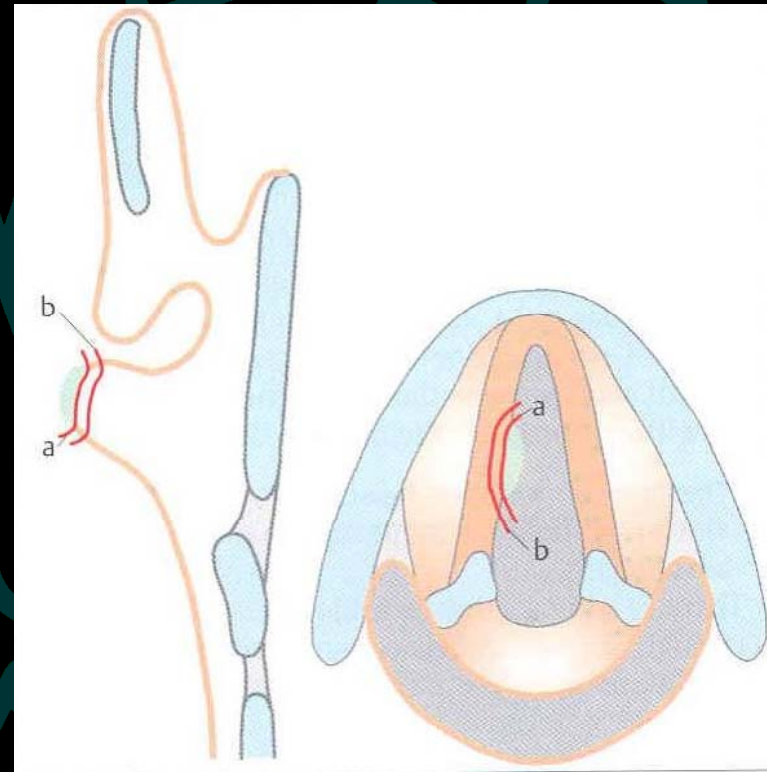
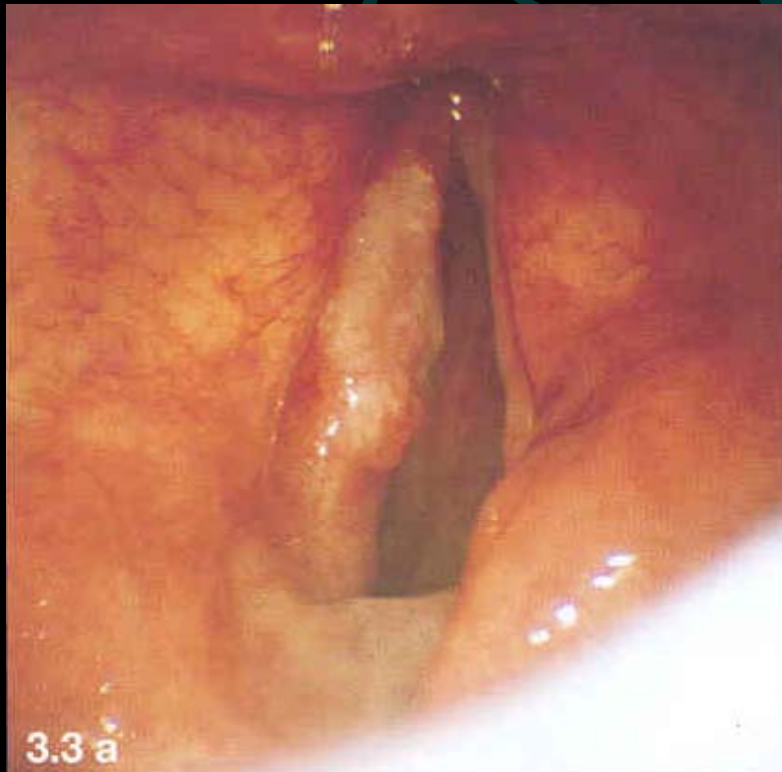
Oxygen



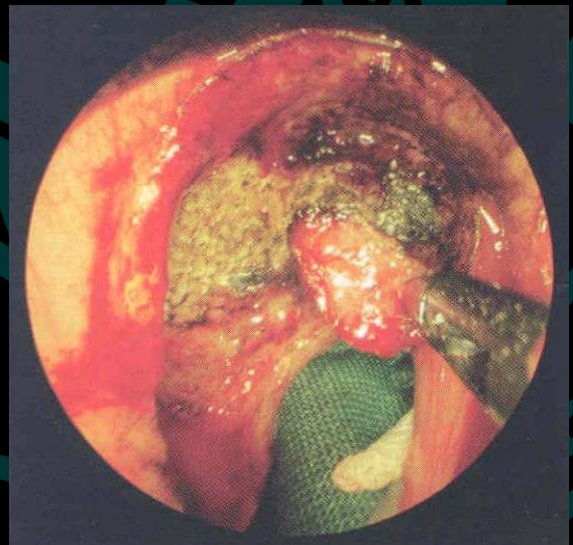
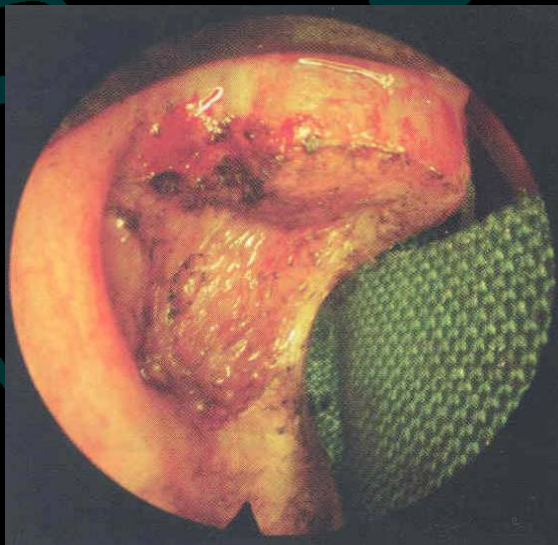
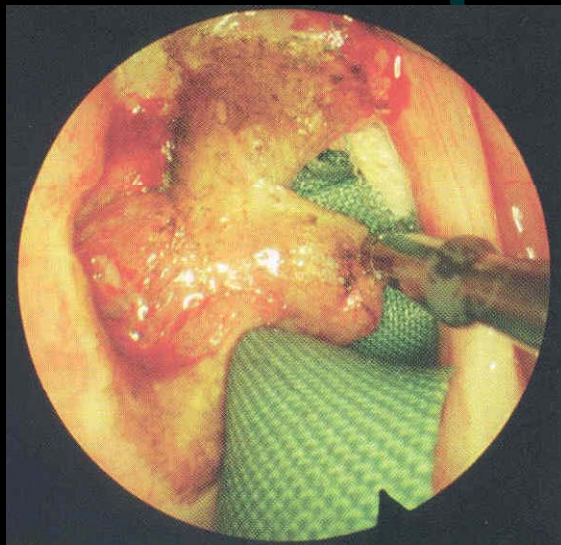
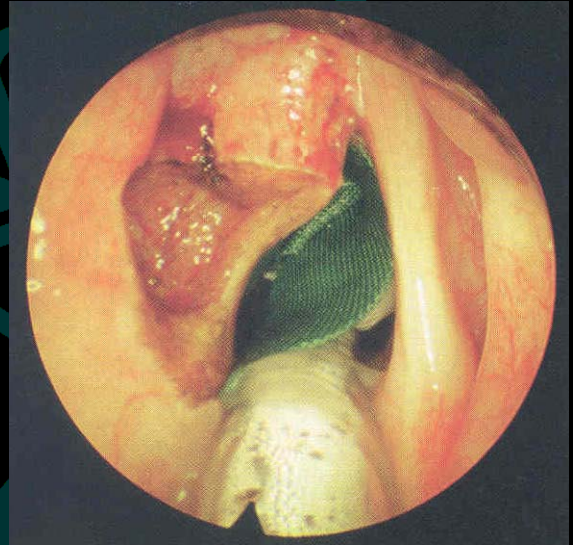
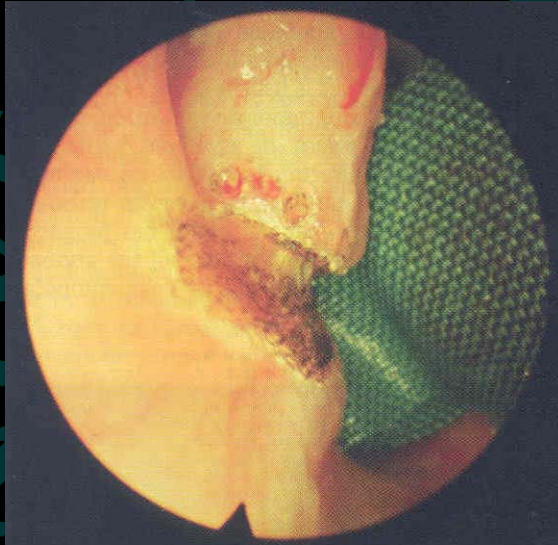
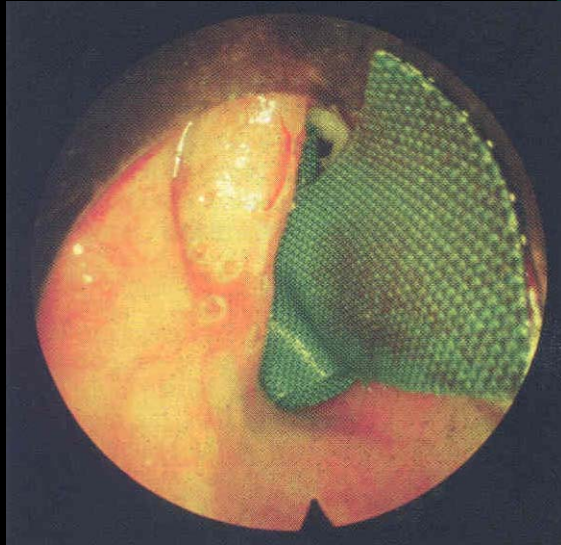
# Complications

- Aspiration:
  - Abx
  - ? Trach
- Dyspnea:
  - Steroids
  - Laser excision of edematous mucosa
  - Trach

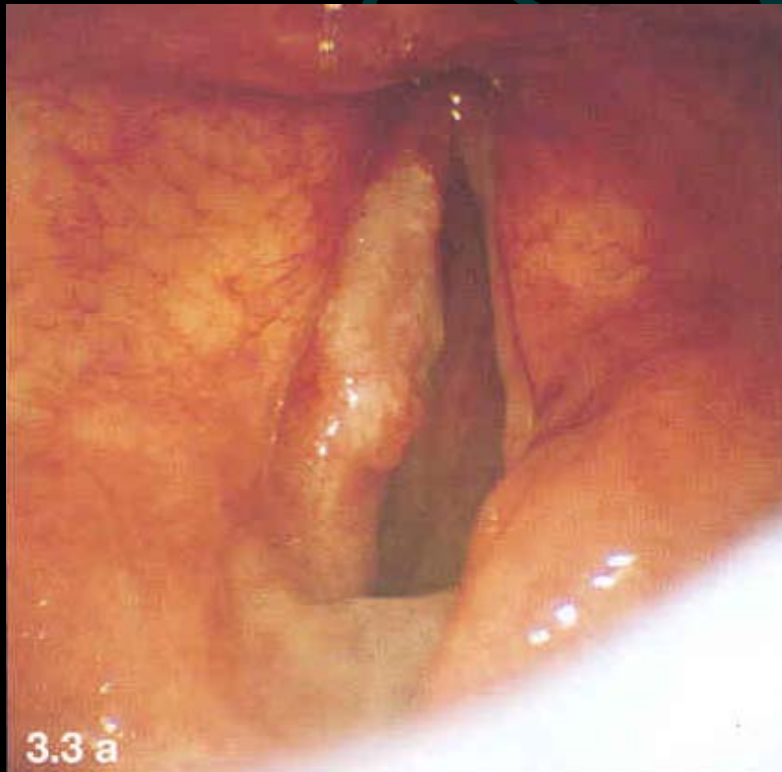
# Glottic (T1aN0)



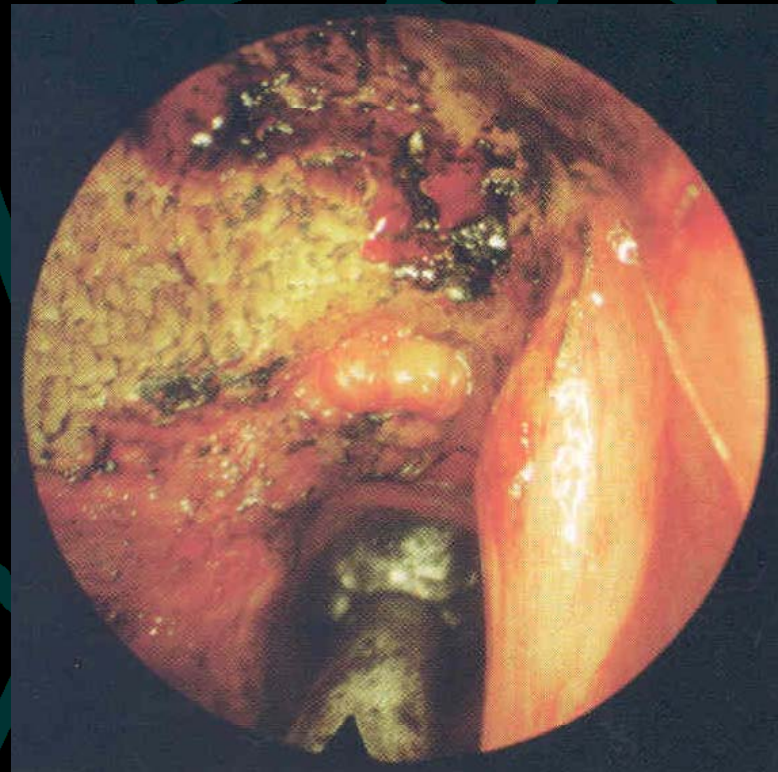
# Glottic (T1N0)



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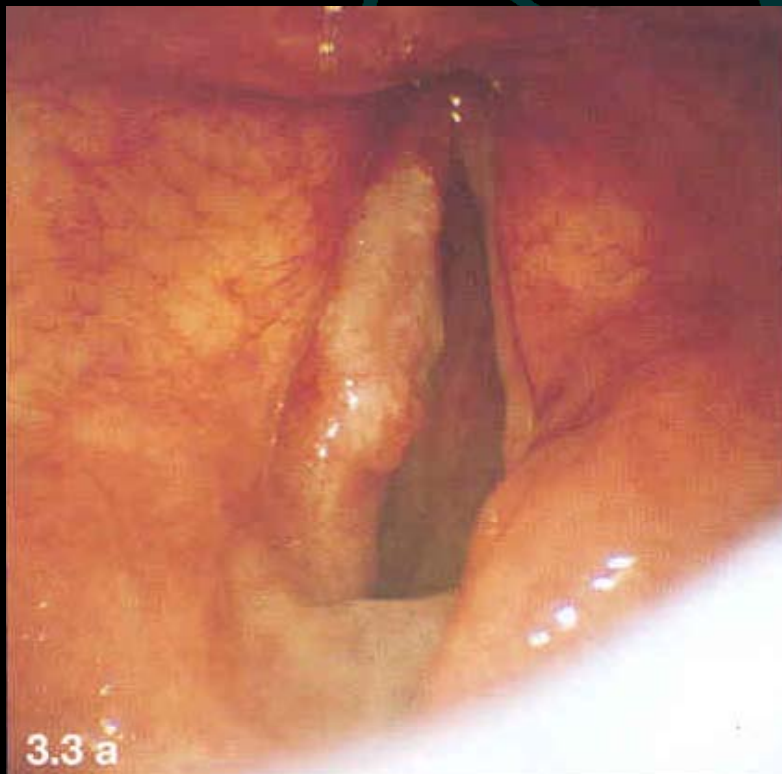


Pre-op

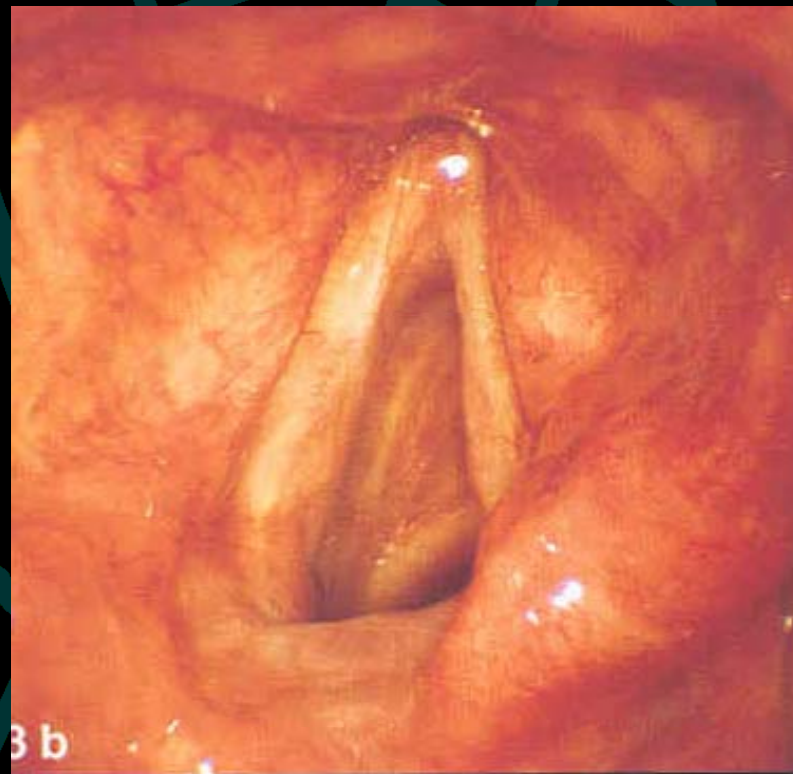


Intra-op

# Glottic (T1N0)

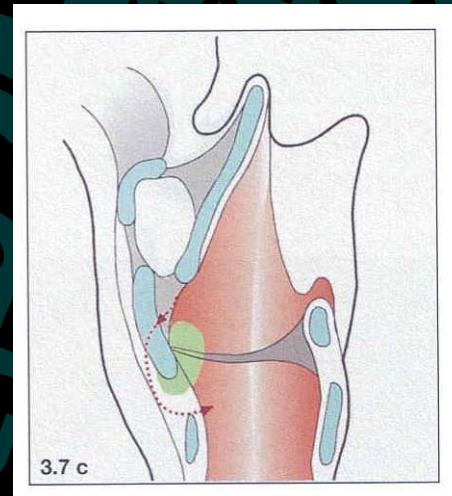
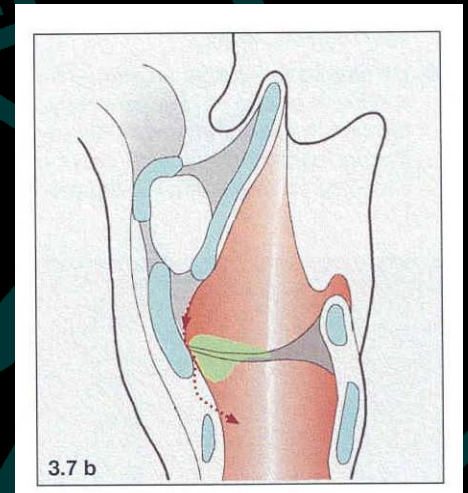
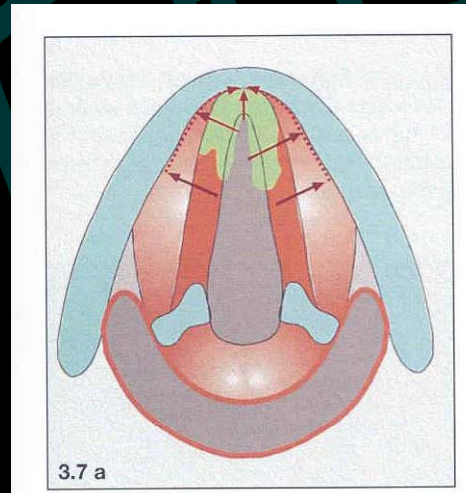
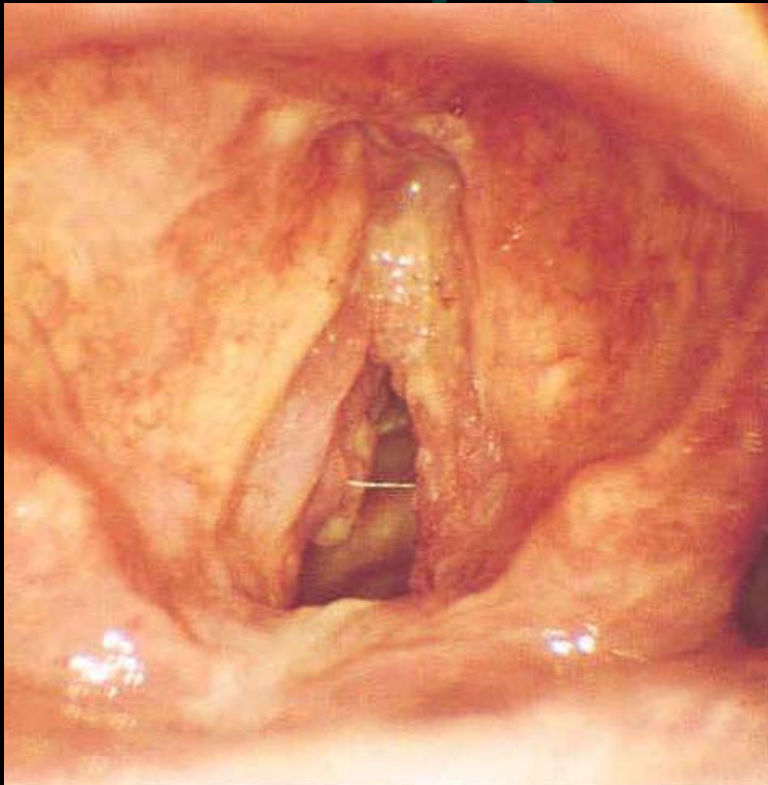


Pre-op



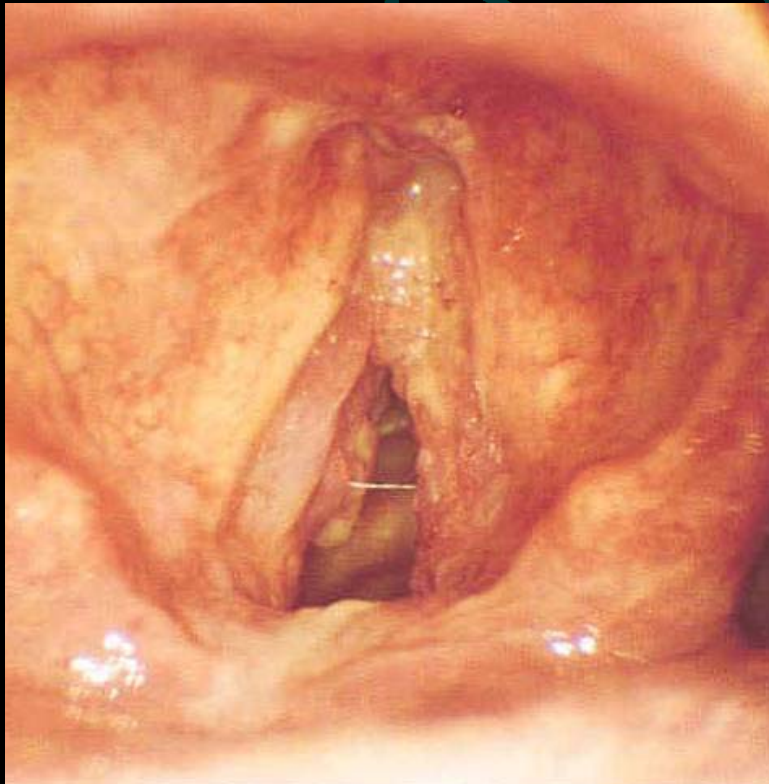
1 year Post-op

# Glottic (T3N0)

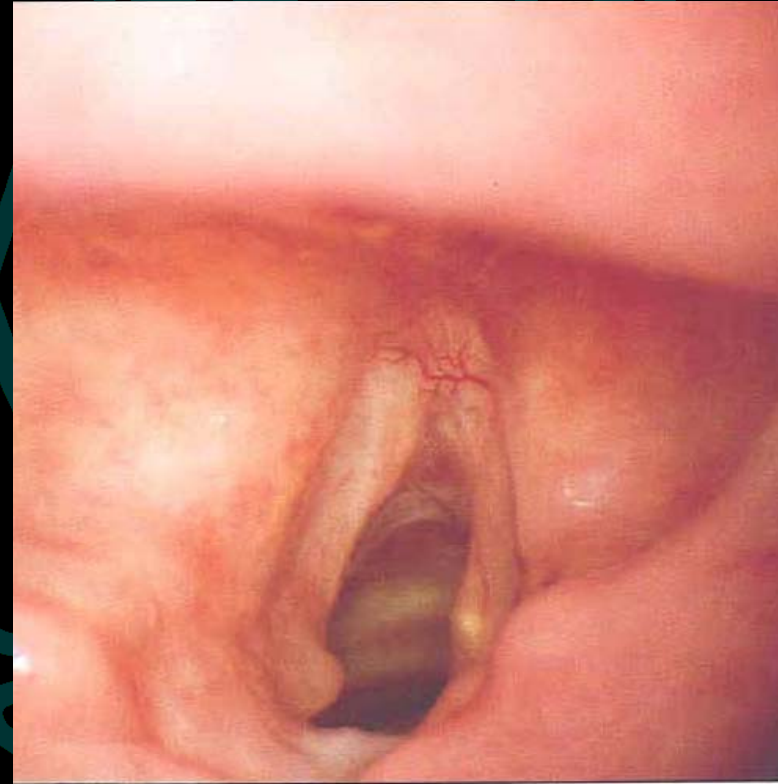




# Glottic (T3N0)

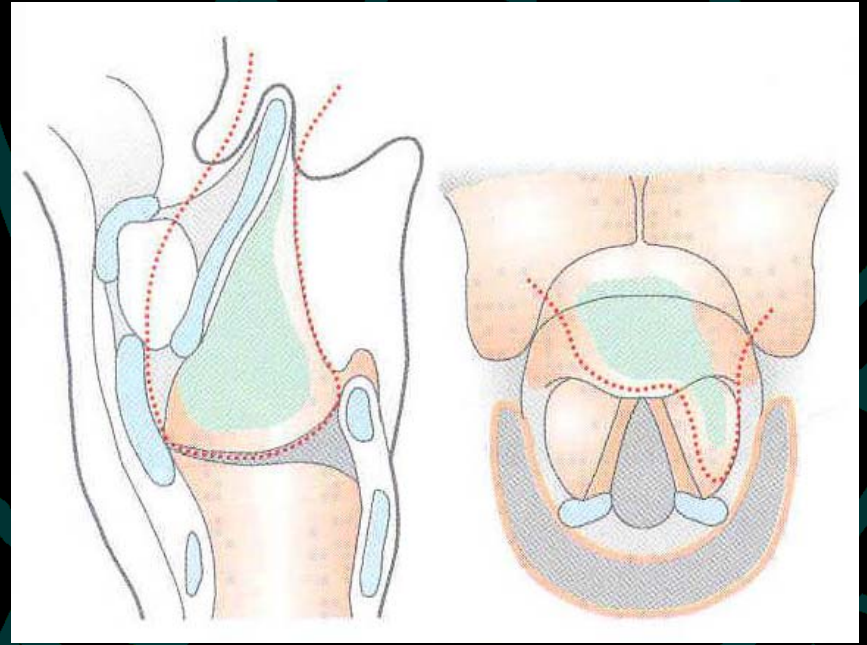


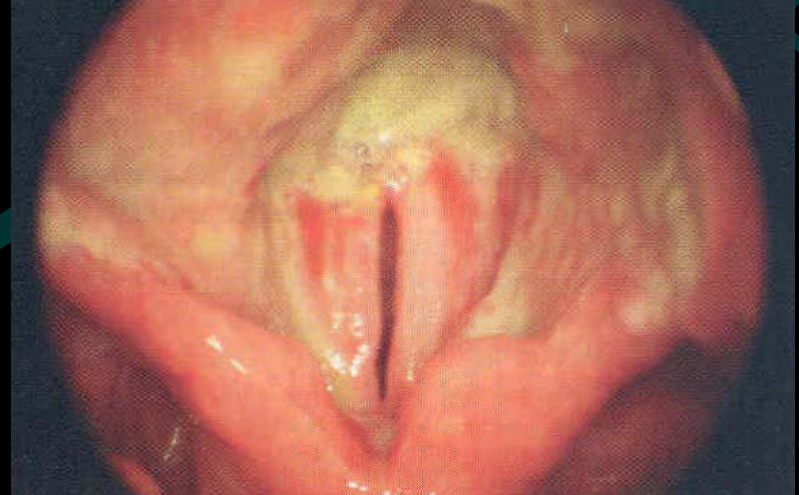
Pre-op



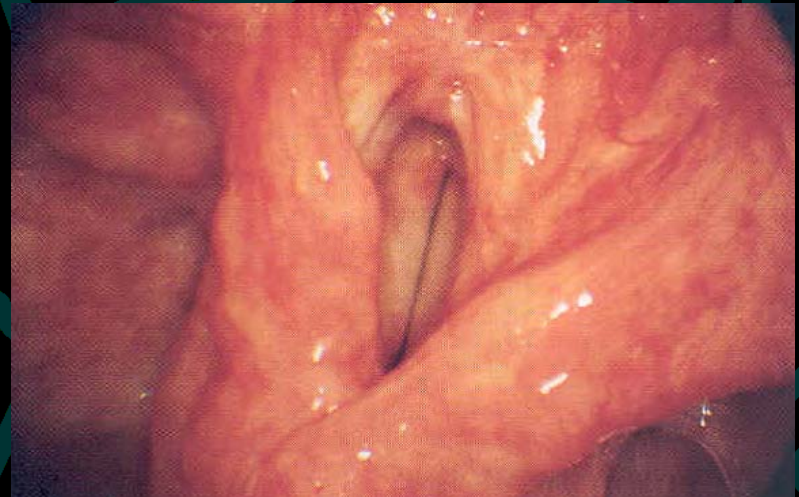
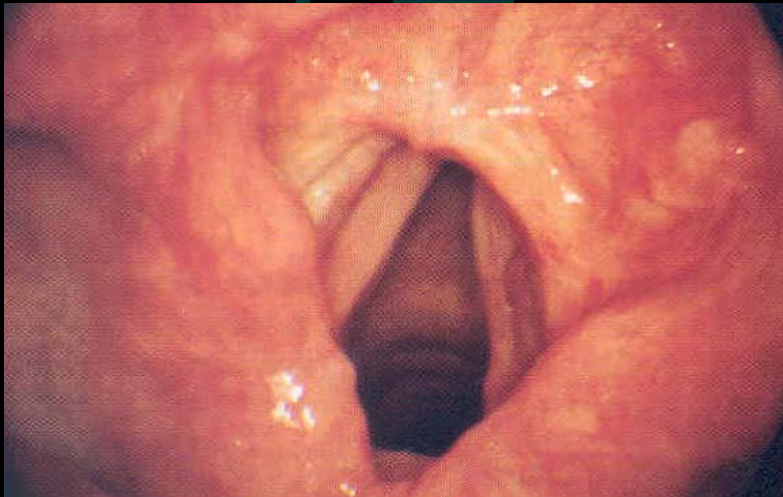
3 months Post-op

# Supraglottic (T2N0)





Intra-op



1 year Post-op

## Results of curative laser microsurgery of laryngeal carcinomas

- 240 patients (1979-1985)
- Group A (n = 159) glottic ca:  
Tis, 29; T1, 96; T2 34.
- All patients were treated by laser
- 6% local recurrences
- one patient needing total laryngectomy
- The overall 5-year survival rate 86.5%

## Results of curative laser microsurgery of laryngeal carcinomas

- The group B patients (n = 81)
- 30 supraglottic patients.
- 58 patients were in tumor category pT2, among them there were 38 with glottic cancer (so called T2b, with vocal cord mobility impaired).
- 17 patients had pT3 and 6 pT4 tumors.

# RESULTS

- Treatment consisted of laser microsurgery plus/minus neck dissection (23/81 = 28%) plus/minus postoperative radiotherapy (29/81 = 35%)
- There were 22% local recurrences with 6 patients requiring total laryngectomy
- The overall 5-year survival rate (Kaplan-Meier) was 59%

# DISCUSSION

- This study confirms the usefulness of laser microsurgery for laryngeal carcinoma.
- Surgery is individualized and adapted to the size of the tumor.
- Multiinstitutional studies are needed to compare laser microsurgery with radiation therapy.

## Transoral laser microsurgery for advanced laryngeal cancer

- A total of 117 patients
- stage III or stage IV, glottic or supraglottic
- Treated with TLM from 1997 to 2004
- Neck dissection in 91 patients
- Adjuvant radiotherapy in 45 patients

- **Steiner et al**, Arch Otolaryngol Head Neck Surg. 2007 Dec;133(12):1198-204.



# RESULTS

- Local control, 74%;
- Disease-free survival, 58%;
- Overall survival, 55%;
- Distant metastases, 14%.
- 2 patients (3%) tracheotomy dependent,
- 4 patients (7%) feeding-tube dependent.

- **Steiner et al**, Arch Otolaryngol Head Neck Surg. 2007 Dec;133(12):1198-204.

# CONCLUSIONS

- In patients with advanced laryngeal cancer, TLM with or without radiotherapy is a valid treatment strategy for organ preservation.
- Furthermore, low morbidity and mortality and excellent oncologic and functional outcomes make TLM an attractive therapeutic option.

- **Steiner et al**, Arch Otolaryngol Head Neck Surg. 2007 Dec;133(12):1198-204.

## Transoral laser microsurgery for carcinoma of the supraglottic larynx

- A two-center prospective case series analysis
- 38 patients underwent TLM for previously untreated carcinoma of the supraglottic larynx between 1997 and 2005
- Pathological T stages were T1 in 8 (21%), T2 in 14 (37%), T3 in 8 (21%), and T4 in 8 (21%).

**-Grant et al,** Otolaryngol Head Neck Surg. 2007 Jun;136(6):900-6.

## Transoral laser microsurgery for carcinoma of the supraglottic larynx

- 26 patients (68%) had neck dissections.
- 13 patients (34%) received adjuvant radiotherapy.
- The mean follow-up for all patients was 31 months

-**Grant et al,** Otolaryngol Head Neck Surg. 2007 Jun;136(6):900-6.

# RESULTS

- Local control were 97%
- Disease-specific survival 80%
- Overall survival 85%
- The overall functional laryngeal preservation rate was 79% (19 of 24)

- **Grant et al,** Otolaryngol Head Neck Surg. 2007 Jun;136(6):900-6.

- CONCLUSIONS:

TLM is a safe and effective treatment for cancer of the supraglottic larynx.

- SIGNIFICANCE:

TLM is an emerging strategy in the management of laryngeal cancer.

**-Grant et al,** Otolaryngol Head Neck Surg. 2007 Jun;136(6):900-6.

## Transoral laser microsurgery for untreated glottic carcinoma.

- A 2 center prospective case series analysis
- 76 patients underwent TLM.
- Pathologic T stages were:  
T1, 45 (59%); T2, 21 (28%);  
T3, 5 (7%); and T4, 5 (7%).

**-Grant et al,** Otolaryngol Head Neck Surg. 2007 Sep;137(3):482-6

## Transoral laser microsurgery for untreated glottic carcinoma

- Five (7%) patients had neck dissections
- Five (7%) patients received adjuvant radiotherapy
- Mean follow-up was 42 months

**-Grant et al,** Otolaryngol Head Neck Surg. 2007 Sep;137(3):482-6



# RESULTS

- Local control 93%
- Disease specific survival 90%
- Overall survival 94%
- The average hospital stay was 2 days
- The overall laryngeal preservation rate was 95% (72 of 76)

# CONCLUSIONS

- TLM is a safe and effective treatment in select carcinoma of the glottic larynx.
- Low morbidity and mortality and short periods of hospitalization make TLM an attractive therapeutic option.

**-Grant et al,** Otolaryngol Head Neck Surg. 2007 Sep;137(3):482-6

# Transoral laser microresection for cancer of the larynx involving the anterior commissure

- Retrospective review of 39 patients with SCCA involving the anterior commissure of the larynx(1996 -2001)
- 23 patients pT1 or pT2
- 16 patients pT3 or pT4
- 20 patients had cancers exhibiting spread to the subglottis

-**Pearson et al**, Laryngoscope. 2003 Jul;113(7):1104-12

# RESULTS

- None of (pT1 or pT2a) Pts had local recurrence or received postoperative radiotherapy.
- 5 patients advanced disease (pT2b/pT3 or pT4 cancer) required second treatments for persistent or recurrent disease.
- 2 patients (both previously irradiated) developed delayed recurrences requiring total laryngectomy.

# RESULTS

- Voice remained no worse after transoral laser microresection in 19 patients.
- It was one level worse (on a scale of 0 to 5) for 16 patients.
- 12 patients left the hospital on a same-day basis. The average hospital stay was 3.3 days.

# CONCLUSION

- Transoral laser microsurgery is one of the options to be considered for the treatment of squamous cell cancer involving the anterior commissure of the larynx.

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# Impact of Anterior Commissure Involvement on Local Control of Early Glottic Carcinoma Treated by Laser Microresection

Steiner W et al. Laryngoscope. (2004)

# Voice outcomes following transoral laser microsurgery for early glottic squamous cell carcinoma.

- T1 or T2 glottic cancer (1997 and 2004)
- A voice recording was made pre-op then at 12 weeks post-operatively and scored by two independent speech therapists
- Follow up was for a minimum of two years

**-Kennedy et al,** J Laryngol Otol. 2007 Dec;121(12):1184-8. Epub 2007 Apr 20.



# RESULTS

- Survival T1 89.4 % & T2 85.3 %
- After a mean follow up of 47 months
- 19 pts staged T1 underwent cordectomy
- Second procedure was required in 22.2 %
- However, none required a laryngectomy

# RESULTS

- 34 patients staged T2 underwent hemilaryngectomy
- second procedure was required in 41.2%
- 8.8 % requiring salvage laryngectomy.

# RESULTS

- The mean Voice Profile for T1 2.37 and for T2 2.68 (range 1 to 4) indicating a mild (2) to moderate (3) degree of voice impairment.

# CONCLUSIONS

- Survival outcomes following transoral laser microsurgery are comparable to treatment with radiotherapy.
- Voice impairment is usually mild to moderate following transoral laser microsurgery for early glottic cancer but overall may be greater than in radiotherapy patients.

# CONCLUSIONS

- The repeatability of transoral laser microsurgery may result in a lower laryngectomy rate compared with published series using radiotherapy.

## Voice outcome in T1a midcord glottic carcinoma: laser surgery vs radiotherapy

- To compare voice quality after radiotherapy or endoscopic laser surgery in patients with similar T1a midcord glottic carcinomas.
- Retrospective cohort study. Two cohorts of consecutive patients willing to participate after treatment for primary T1a midcord glottic ca with laser surgery (18 of 23 eligible) or radiotherapy (16 of 18 eligible).

**-Sjögren et al** Arch Otolaryngol Head Neck Surg. 2008 Sep;134(9):965-72

## **Voice outcome in T1a midcord glottic carcinoma: laser surgery vs radiotherapy**

- Posttreatment voice quality was evaluated according to a multidimensional voice protocol based on validated European Laryngological Society recommendations, including perceptual, acoustic, aerodynamic, and stroboscopic analyses, together with patient self-assessment using the Voice Handicap Index

# RESULTS

- Approximately half of the patients had mild to moderate voice dysfunction in the perceptual analysis (53% [8 of 15] in the radiotherapy group and 61% [11 of 18] in the laser surgery group)
- The voice profile in the laser surgery group was mainly breathy; in the radiotherapy group, it was equally breathy and rough



# CONCLUSIONS

- Endoscopic laser surgery offers overall voice quality equivalent to that of radiotherapy for patients with T1a midcord glottic carcinoma
- although specific voice profiles may ultimately be different for the 2 modalities.

# CONCLUSIONS

- We believe that endoscopic laser surgery is the preferred treatment in these patients because it provides oncologic control similar to that of radiotherapy
- The additional benefits of lower costs, shorter treatment time

# Conclusions

- Survival & local control similar
- Surgery:
  - 1 day +
  - Cost effective
  - Leaves all tx options available
  - \* Voice

\*Functional Organ Preservation



**THANK YOU**

