



SURGICAL REFINEMENTS AND COPING WITH ADVERSE EVENTS

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SURGICAL CONSEQUENCES OF CURRENT KNOWLEDGE ON POSTLARYNGECTOMY VOICE PHYSIOLOGY

- Prosthetic voice restoration and the surgical procedures to improve voice quality are a kind of phonosurgery: closure of the pharynx not only means the restoration of the alimentary tract, but also the creation of a new sound source!
- Refinements in surgical techniques
 1. Prevention of hypertonicity of the neoglottis to optimize voicing
 2. Prevention of a too narrow stoma to avoid cannula use
 3. Prevention of a deep stoma to facilitate application of HME and Automatic speaking valve

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SURGICAL REFINEMENTS

- Prevention of hypertonicity
 - Prevention of narrow tracheostoma
 - Prevention of deep tracheostoma
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IMPACT OF A LARYNGECTOMY AND SURGICAL CLOSURE TECHNIQUE ON SWALLOW BIOMECHANICS AND DYSPHAGIA SEVERITY

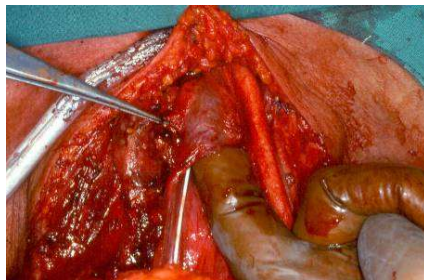
- Laryngectomy was associated with reduced peak mid-pharyngeal pressures during swallowing and with increased hypopharyngeal intrabolus pressure when compared to controls.
 - Patients who had undergone mucosa-and-muscle pharyngeal reconstruction had higher peak mid-pharyngeal pressures compared to those who had mucosa-alone closure ($P \leq .04$). Combined mucosa-and-muscle closure was also associated with reduced post-swallow residue, indicative of a more efficient swallow.
 - No Voice data
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CONCLUSIONS

- Literature is not decisive on how to close the pharyngeal defect
- Vertical closure of the pharyngeal defect implies a higher chance of pseudoepiglottic formation / fistulisation

MEDIAN MYOTOMY



Short myotomy of the cricopharyngeus muscle/upper oesophageal sphincter*

HYPERTONICITY

Hypertonicity or spasm of the pharyngoesophageal musculature is the most common reason for failure to acquire fluent speech

Algorithmic approach for solutions

1. speech therapy
2. relaxation exercises
3. Bupivacaine / Ropivacaine
4. chemical denervation with Botulinum toxin*
5. surgical treatment (complete myotomy/neurectomy)

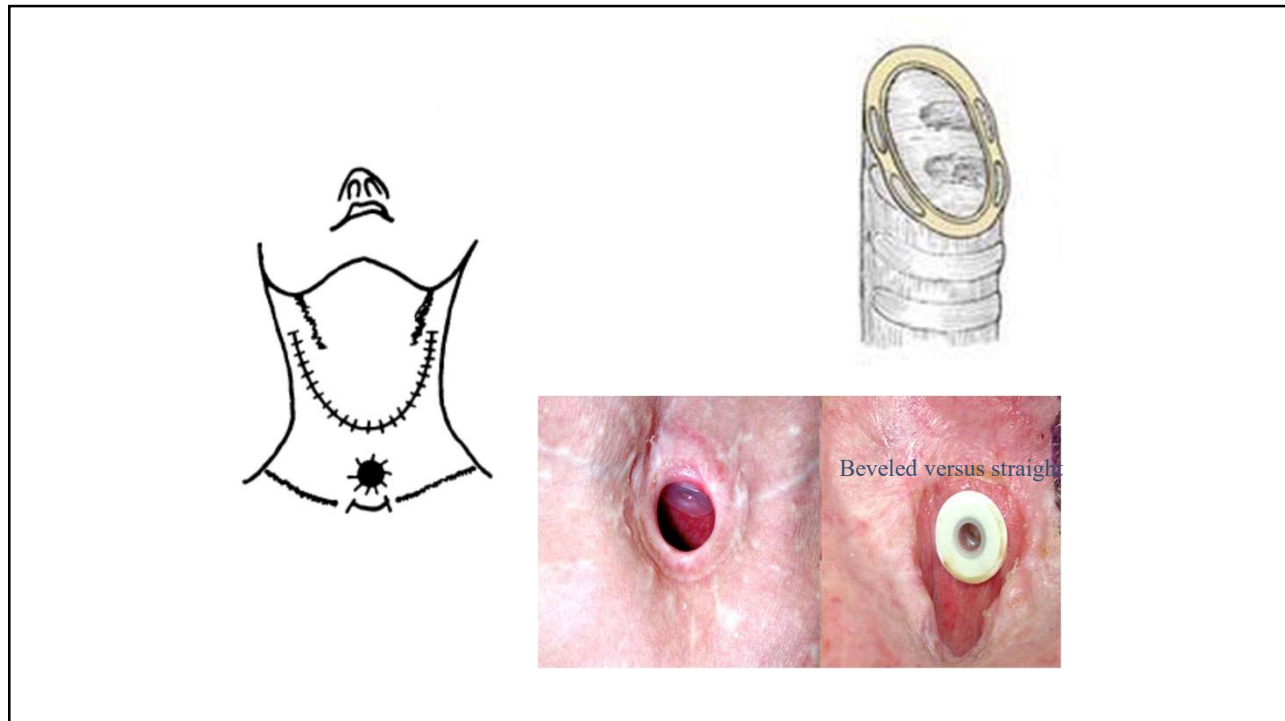
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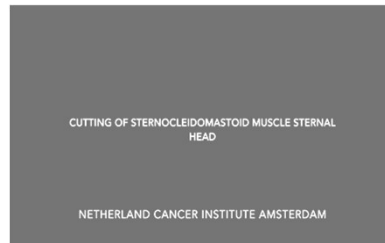
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SECTIONING OF STERNAL HEADS OF THE STERNOCLEIDOMASTOID MUSCLES

- Sectioning of the sternal head of the sternocleido-mastoid muscles results in a flatter area around the stoma



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INDICATIONS FOR PROSTHESIS REPLACEMENT

- **Prosthesis-related**: leakage through prosthesis and obstruction
- **Fistula-related**: leakage around prosthesis, atrophy, hypertrophy and/or infection of fistula, spontaneous loss of prosthesis

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Ref: Petersen, Japke F., et al. "Postlaryngectomy prosthetic voice rehabilitation outcomes in a consecutive cohort of 232 patients over a 13-year period." *Head & neck* 41.3 (2019): 623-631.



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LEAKAGE THROUGH ANY VOICE PROSTHESIS IS MOSTLY CAUSED BY BIOFILM FORMATION (*CANDIDA*)

- The device life of a voice prosthesis is often limited because a biofilm (often referred to as *Candida*, a yeast that is found in the biofilm)
- Biofilm leads to leakage through the device or increased speaking resistance
- Biofilms on voice prostheses consist of many micro organisms, including streptococci, staphylococci, and yeasts
- **Solution**: replace the voice prosthesis



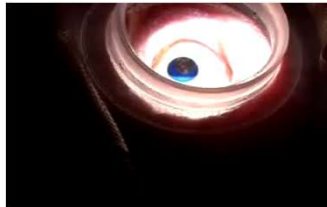
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OTHER REASON FOR EARLY LEAKAGE THROUGH VOICE PROSTHESIS

- Negative intrathoracic pressure during swallowing and deep inhalation, causing a spontaneous opening of the valve and aerophagia
- Solution
 - Magnets in valve and valve seat of voice prosthesis (ActiValve)
 - Repositioning of TE fistula at 5mm from rostral rim tracheostoma?



swallowing



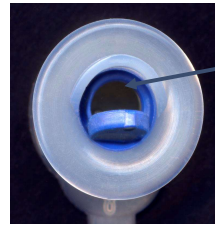
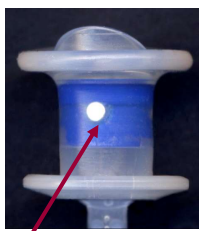
Inhalation, 21.000x/day

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SOLUTION FOR CANDIDA AND 'UNDER-PRESSURE'* PROBLEM: ACTIVEVALVE

2 Magnets counteract 'under-pressure' and provide 'active' valve closure

Valve and valve seat of candida resistant fluoroplastic (teflon-like material)



Magnets

Valve and
Valve seat made
of fluoroplastic
(teflon-like)
material

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PROVOX ACTIVEVALVE 364 DAYS IN SITU - REMOVED FROM PATIENT, WHO NEEDED REPLACEMENT EVERY 2-4 WEEKS



For comparison: after Silveroxide impregnation in silicone not Candida-resistant!

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ATROPHY OF TE FISTULA

Most prominently gastroesophageal reflux, and/or neoglottis stricture*; NOT prosthesis diameter

Possible causes for atrophy are:

- prolonged pistoning,
- reflux
- previous treatments (radiotherapy, chemotherapy),
- recurrent or metastatic disease,
- poor thyroid function,
- poor nutrition,
- puncture technique,



* A stenosis will result in an increased velocity of fluids, which increases the pressure and the risk of periprosthetic leakage; dilatation of the stenosis will very likely solve this!

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OVAL SHAPED TE FISTULA AFTER INPROPER PRIMARY PUNCTURE USING SURGICAL KNIFE



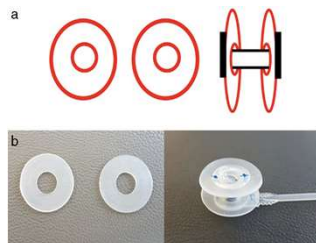
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SOLUTION ALGORITHM FOR PERI-PROSTHETIC LEAKAGE

1. Downsizing : **one shaft length!**
2. Application of thin (0.5 mm) silicon anti-leakage ring behind tracheal flange (Xtraflange)
3. Xtraseal with esophageal ring
4. Submucosal purse string suture (3x0 vicryl) around fistula tract
5. Tissue augmentation with fat, Renu Voice, collagen or Bioplastique (fibrin, Cymetra)
6. Removal of prosthesis to allow shrinkage of the TE fistula tract (with nasogastric tube feeding and cannula)
7. In case of failure: surgical closure of TE fistula and secondary TEP after 4-6 weeks



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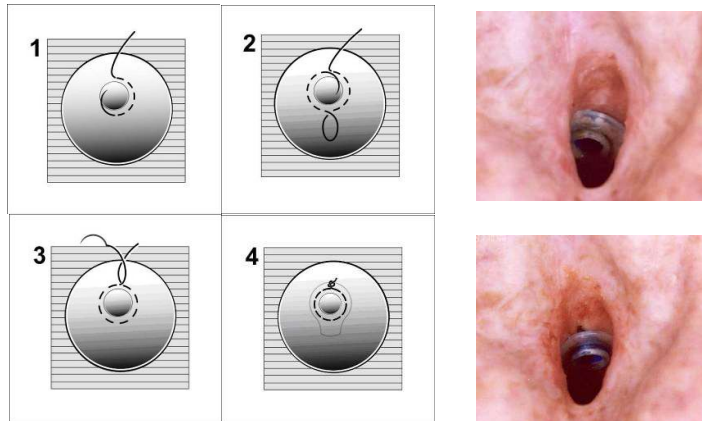
Combination of custom made tracheal and esophageal washers



Provox Vega XtraSeal

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PURSE STRING SUTURE, TO IMMEDIATELY STOP PERIPROSTHETIC LEAKAGE

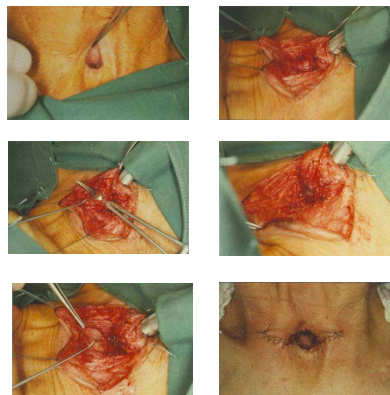


Peeters, A. J. G. E., G. C. M. Vreeburg, and F. J. M. Hilgers. "Chirurgische behandeling van spraakbuttonlekkage." *Nederlands tijdschr Geneesk* 140 (1996): 1793-1794.
 Jacobs, Kristien, Pierre R. Delaere, and Vincent LM Vander Poorten. "Submucosal purse-string suture as a treatment of leakage around the indwelling voice prosthesis." *Head & Neck: Journal for the Sciences and Specialties of the Head and Neck* 30.4 (2008): 485-491.



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SURGICAL CLOSURE OF TE FISTULA



Incision on the cranial border of the stoma, to carefully separate the trachea and oesophagus and to dissect the fistula completely

close the oesophageal and tracheal side separately in two layers.

Sometimes tissue has to be inserted between trachea and esophagus (SCM or PM- muscle flap).



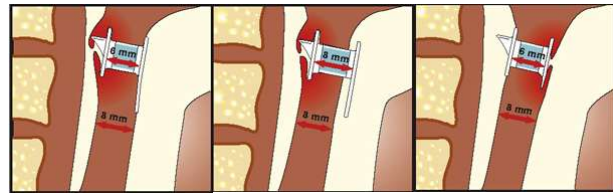
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HYPERTROPHY TE FISTULA

- Possible causes too tight fit of VP, infection, granulation, reflux
- Due to the swelling of the tissues the prosthesis becomes embedded in the mucosa at the esophageal or tracheal side of the fistula
- Subsequently, the prosthesis may even become dislodged or completely extruded

Solution:

- A prosthesis of the proper length should be inserted.
- Upsize two shaft lengths



Posterior fistula infection and/or edema can initiate the development of an esophageal pocket

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OVERGROWTH OF GRANULATION TISSUE OVER TRACHEAL FLANGE



Upsizing



Resection with cautery



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RULE OF THUMB

- 50% of the patients only require replacement of the prosthesis, for leakage through the device
- 50% of the patients experience fistula problems, which require special attention, but mostly are easily solvable
- these adverse events are seen in 15% of replacements

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GENERAL CONCLUSION

AS LONG AS YOU MASTER THE PRINCIPLES OF THE VOICE RESTORATION USING A VOICE PROSTHESIS, 80% OF THE ADVERSE EVENTS ARE EASILY SOLVABLE

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STOMAL RECONSTRUCTION

Plastic or flap construction technique

Lam *et al.*

- X-shaped incision >>creating four triangular skin flaps>>trachea was transected horizontally and four slits divided trachea>>skin flaps were sutured into the slits
- 4% stenosis in 25 patients

Kuo *et al.* 213 patients (8-years):13% stenosis

Wax *et al.* no stenosis in 25 patients (6 months) skin flap was inserted into the ant. tracheal wall

