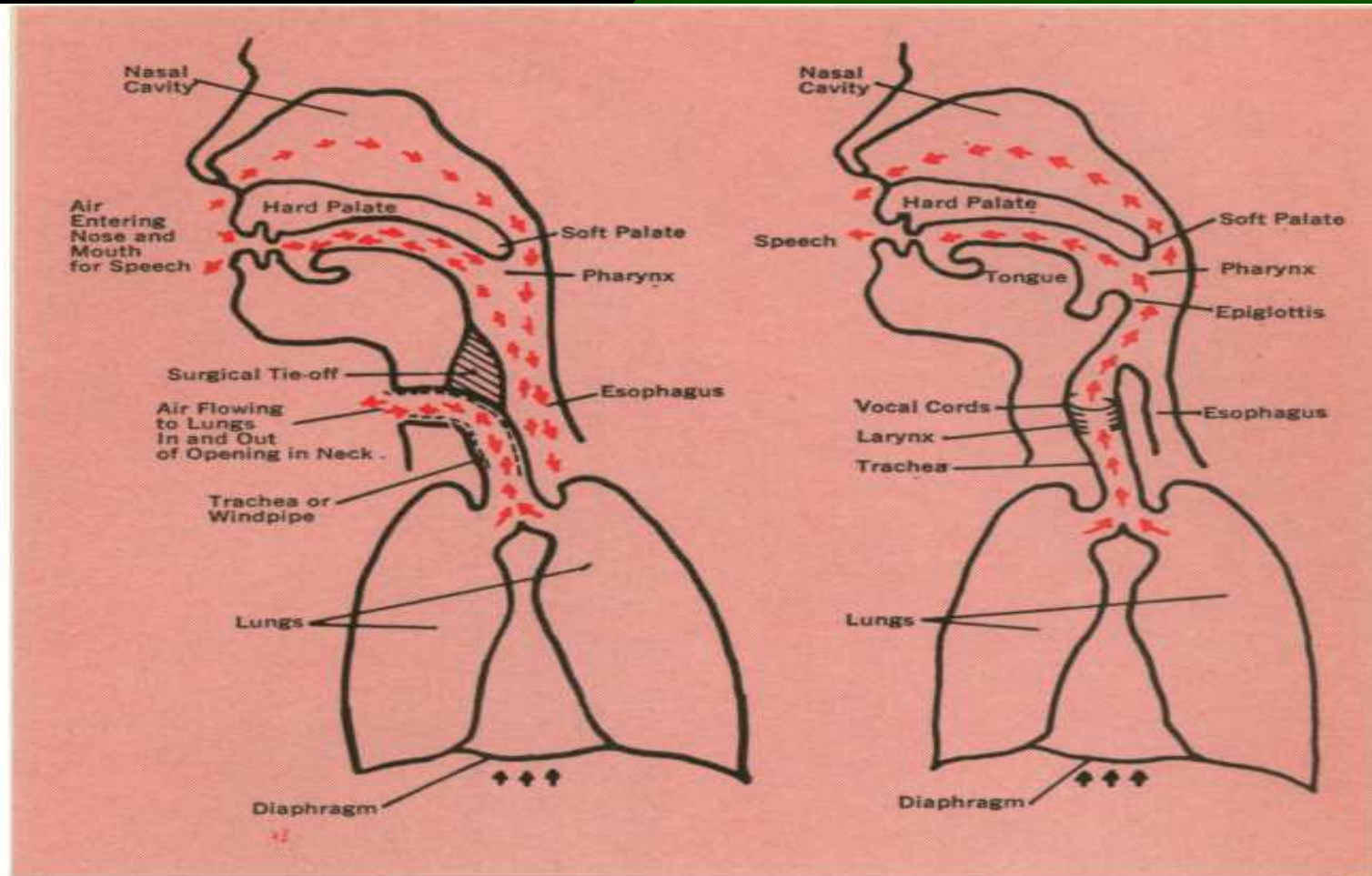


VOICE REHABILITATION AFTER LARYNGECTOMY

F. STOMEIO

ENT DEPARTMENT

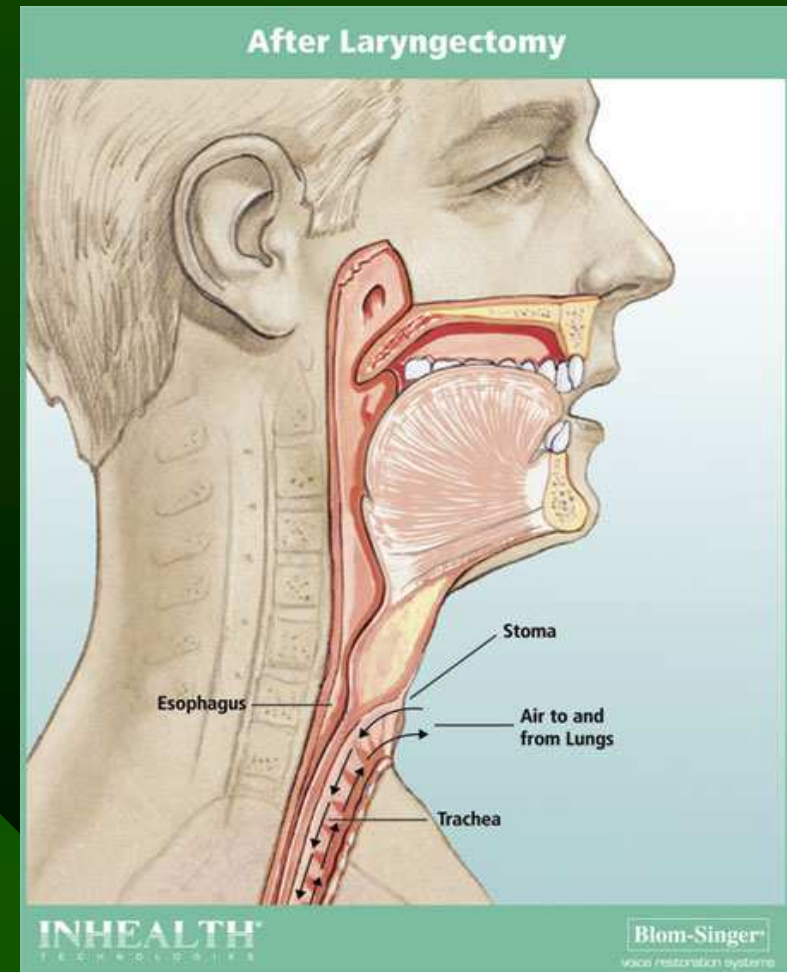
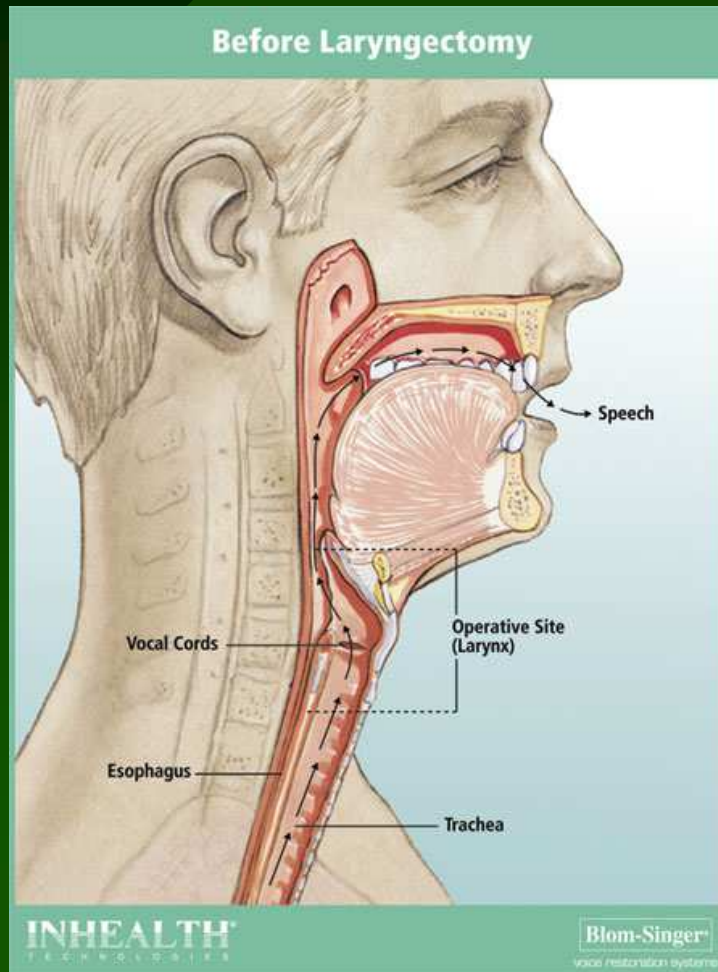
FERRARA



AIRFLOW AFTER laryngectomy (left) and in a normal person. Drawings help patients understand that many structures they normally use in speech production are still there.

the he can make only certain voiceless sounds that
 doe are produced by tougue, cheek, and lip
 the compressed of the air filling his mouth or
 res throat and articulators

Before and After Laryngectomy





Voice therapy

Voice therapy——total

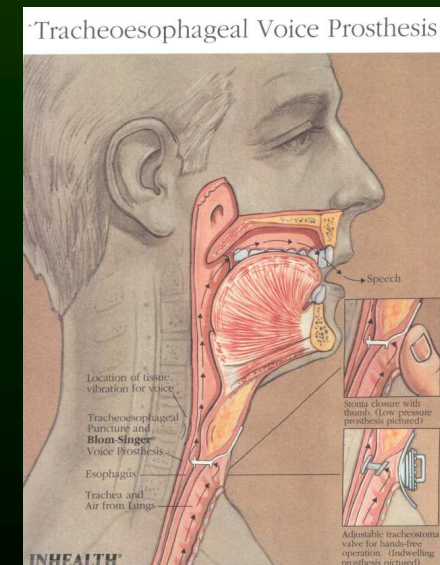
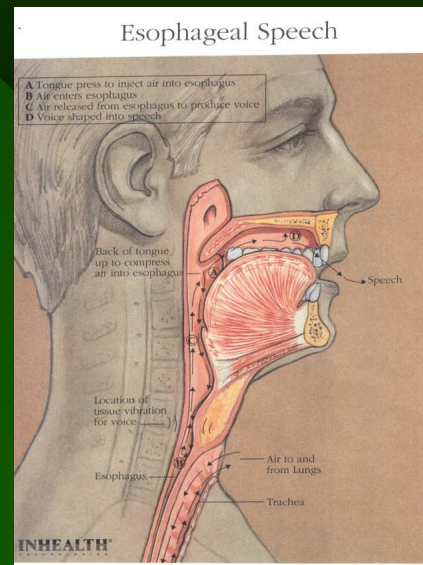
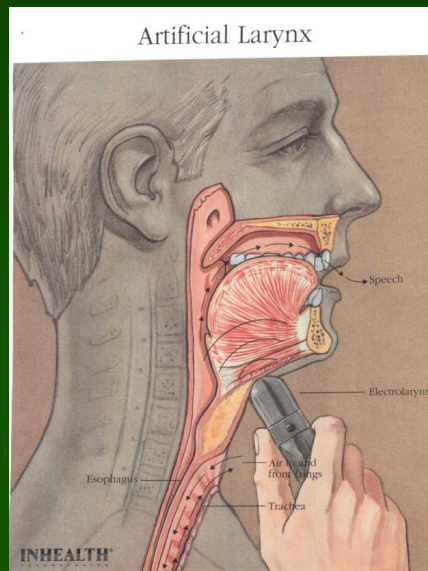
- * Begins with a review of the mechanics of speech production as it occurs when the larynx is present
- * Tell the patient that much of his speech apparatus has not been altered and the operation did not affect many of his speech habits and skills

Three general communication options:

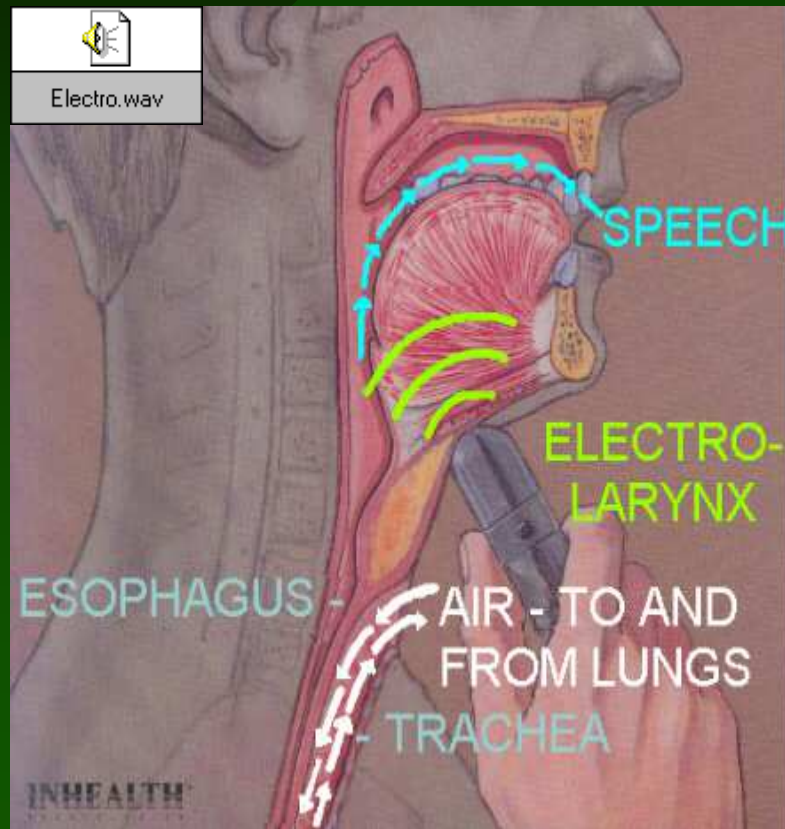
- * Artificial larynx (AL)

- * Esophageal speech (ES)

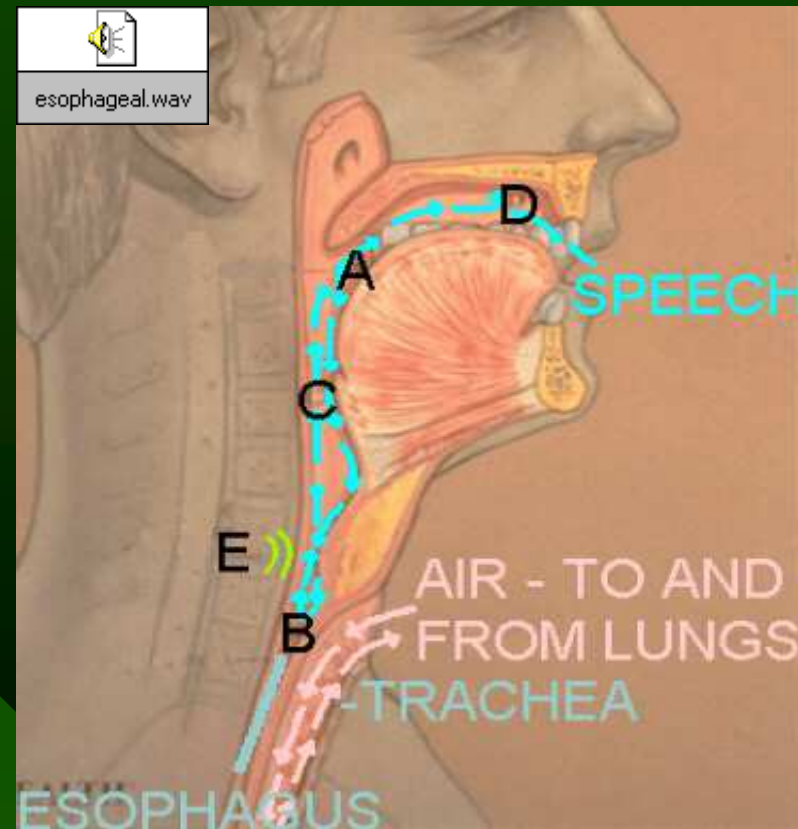
- * Tracheoesophageal puncture and prosthesis (TE)



Post-Laryngectomy Voice Restoration



Artificial Larynx (Electrical)



Esophageal Speech

Voice therapy——total

Adoption rate of the treatment:

Esophageal Speech-----6%

Artificial larynx-electrolarynx-----55%

Tracheoesophageal Prosthesis-----31%

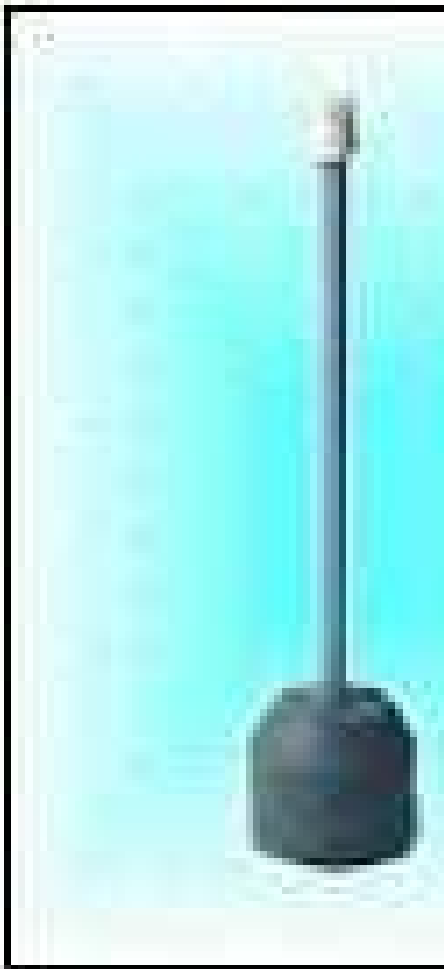
Remained nonvocal-----8%

——By Hillman and colleagues

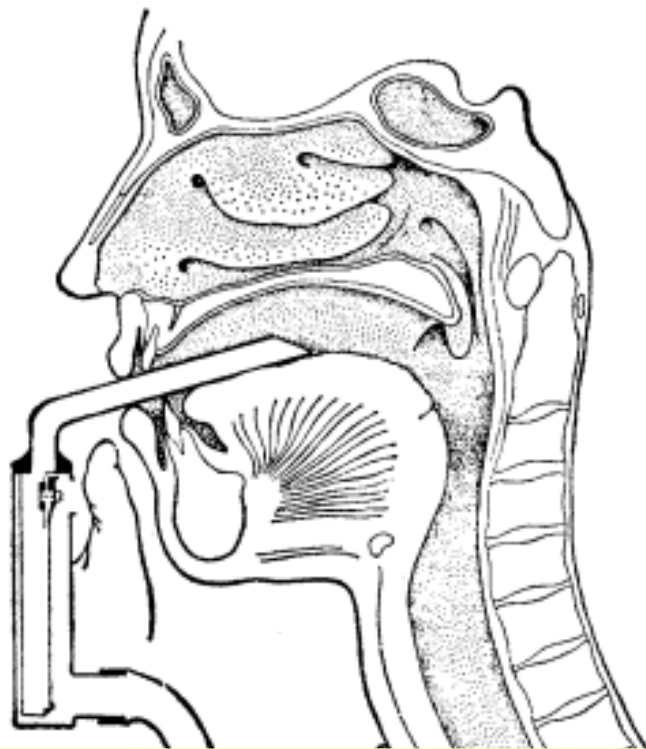
Esophageal Speech-----42%

Both adopt ES and EL-----91%

——By Japanese



Oral Adenoid

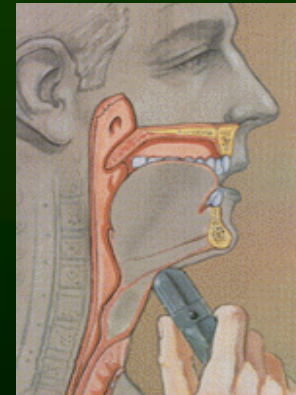


Neck-type Adenoid Vibrator

the

Neck type: you place it against your throat, push a button, and the machine transmits a vibration noise to your throat which you then form into words and sounds with your lips, teeth, and tongue.

Alaryngeal voice



Voice therapy——The artificial larynx

* Station:

Frequently encouraged during the first few days following surgery ; A good alternate mode (other mode fail ,environmental factor)

* Voice quality:

A **monotonic and robotic** sounding (no pitch adjustment options)



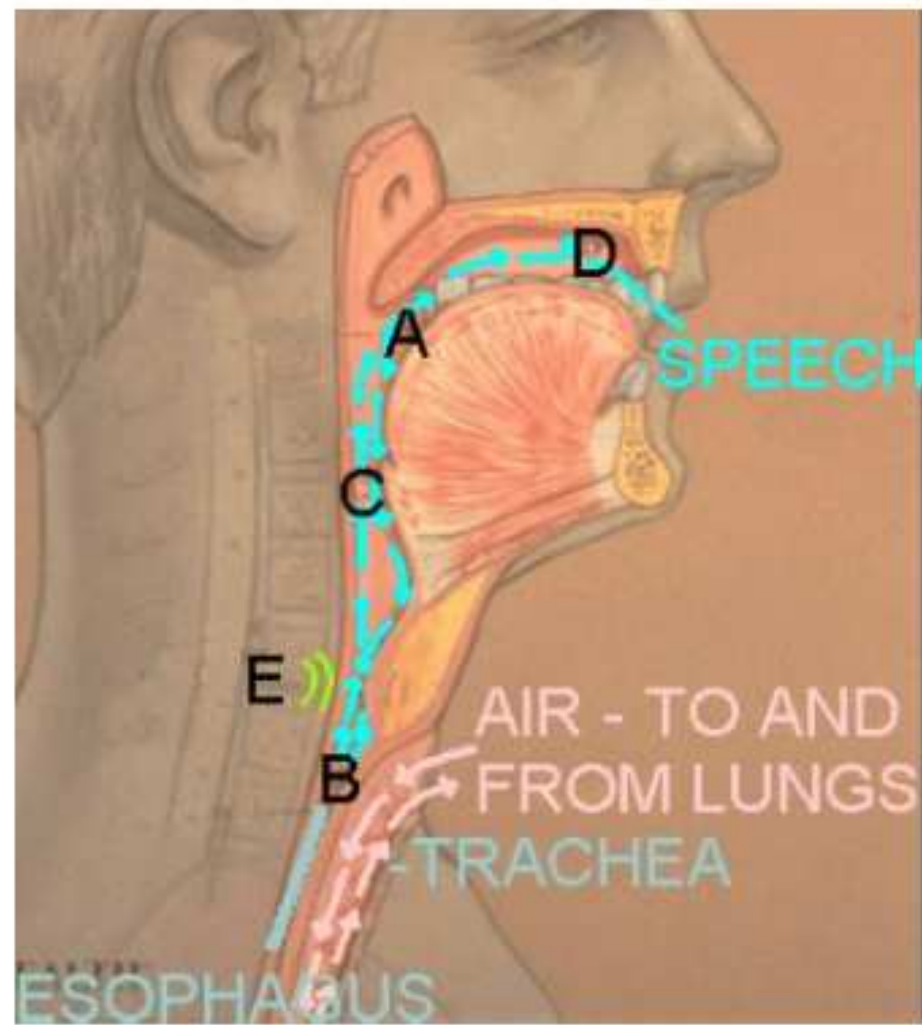
Voice therapy—The artificial larynx

The steps in speech therapy:

- * find the "sweet spot"
- * Learn to hold and operate the EL in your non-dominant hand since it frees up your other hand so that you can write

Voice th Speech

- * Theo
- inject
- space
- esoph
- compr
- esoph
- phary
- * type
- I



- A. Tongue press to inject air into esophagus.
- B. Air enters esophagus.
- C. Air released from esophagus to produce sound.
- D. Sound shaped into speech.

and
fied
rces
the

Voice therapy—Esophageal Speech

* Station:

a **traditional** therapy method

* Voice quality:

hoarse , low-pitched , and often
belchlike quality

Plosive consonants(/p/, /b/, /d/, /t/,
/k/, /g/)

Affricatives containing plosives(/tʃ/,
/dʒ/)



Voice therapy—Esophageal Speech

The steps in speech therapy:

- * Learn to swallow air into the upper part of the esophagus and immediately force it back (as it passes the narrow throat muscles, it is made to pulsate, and a belchlike sound, similar to that of a vowel, is produced)
- * Imitate the movements voluntarily (drinking cokes or any carbonated beverage)
- * Learn to produce vowels, consonants, and syllables
- * Stresses the development of vocal inflection
- * Speech restoration

Voice therapy—Esophageal Speech

Keep in mind:

Avoid any early attempts at speech (**speech therapy** should not be started until the **muscles and mucous membranes** are well healed and no longer tender)

Voice therapy—Esophageal Speech

- * The esophagus functions as **a substitute** for the vocal fold
- * The removal of the larynx **increase the space in the neck** available to the esophagus and permits it to expand to accommodate the air necessary for speech
- * Control the air at the upper opening of the esophagus
- * Learn to **inhibit breathing while speaking**

Levels of esophageal speech

- * No esophageal sound production—no speech
- * Involuntary esophageal sound production—no speech
- * Voluntary sound production part of the time—no speech
- * Voluntary sound production most of the time—vowels differentiated, monosyllabic speech
- * Esophageal sound produced at will—single word speech
- * Esophageal sound produced at will with continuity—word grouping
- * automatic esophageal speech

Voice therapy— Tracheoesophageal

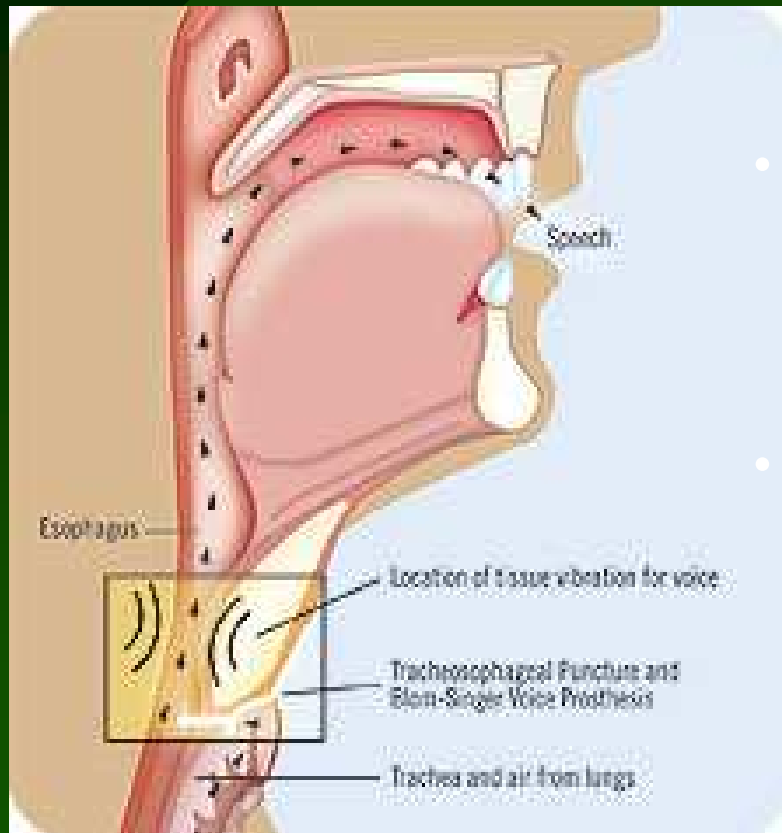
- Theory:

makes a small puncture in the wall between the trachea and esophagus

What is a Tracheoesophageal Prosthesis (TEP)?

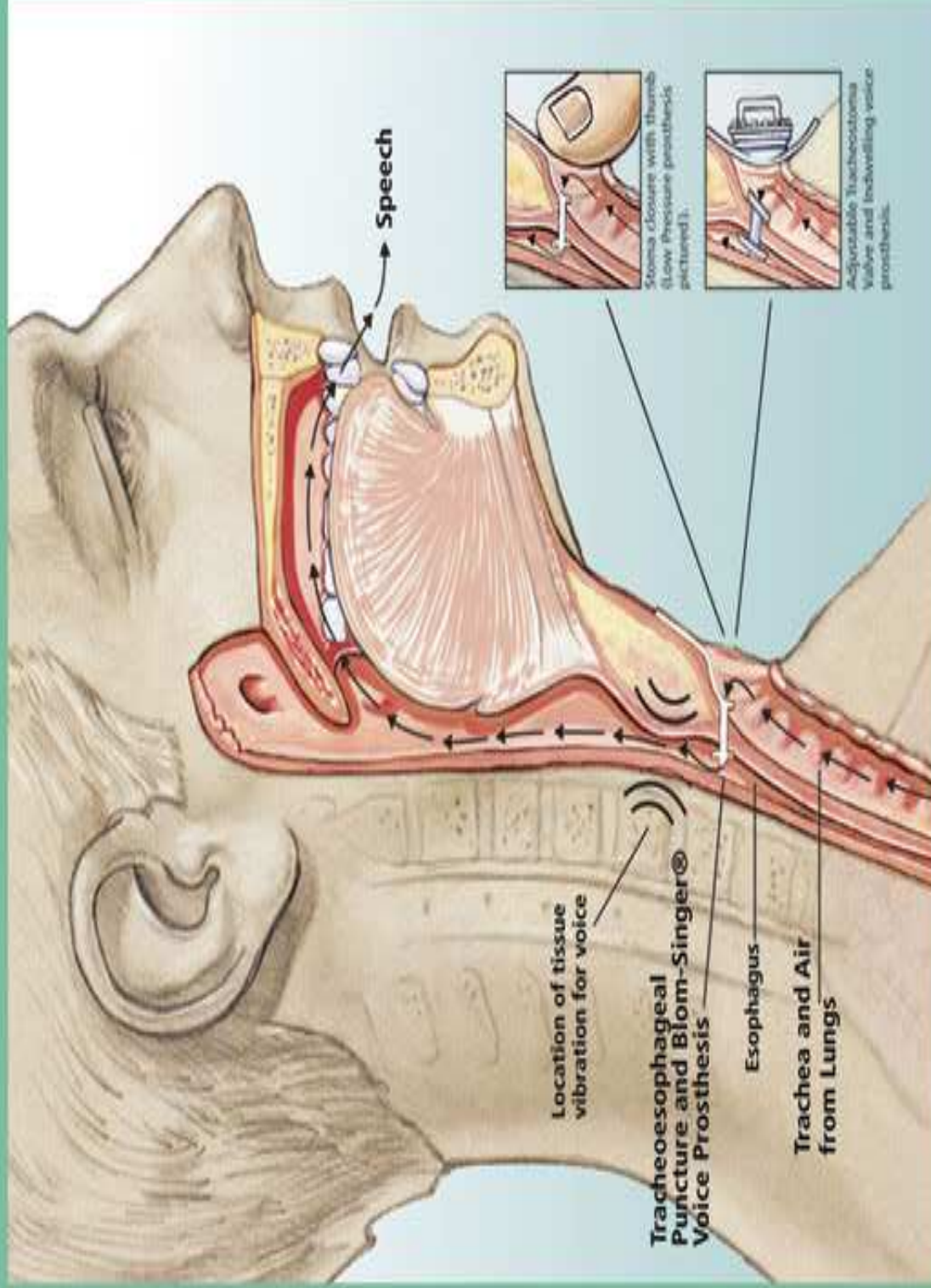
- A TEP is a one way valve inserted through the tracheostoma and placed between the posterior tracheal wall and the anterior esophageal wall (Wetmore et. al, 1985).
- The TEP diverts the airflow from the lungs through the trachea and into the esophagus, allowing the laryngectomee patient to produce voice (Singer and Blom, 1980).

Tracheoesophageal Voice Prosthesis



- For patients that have had laryngectomies
- Trachea is redirected through the neck
 - Stoma to lungs
 - Mouth to esophagus

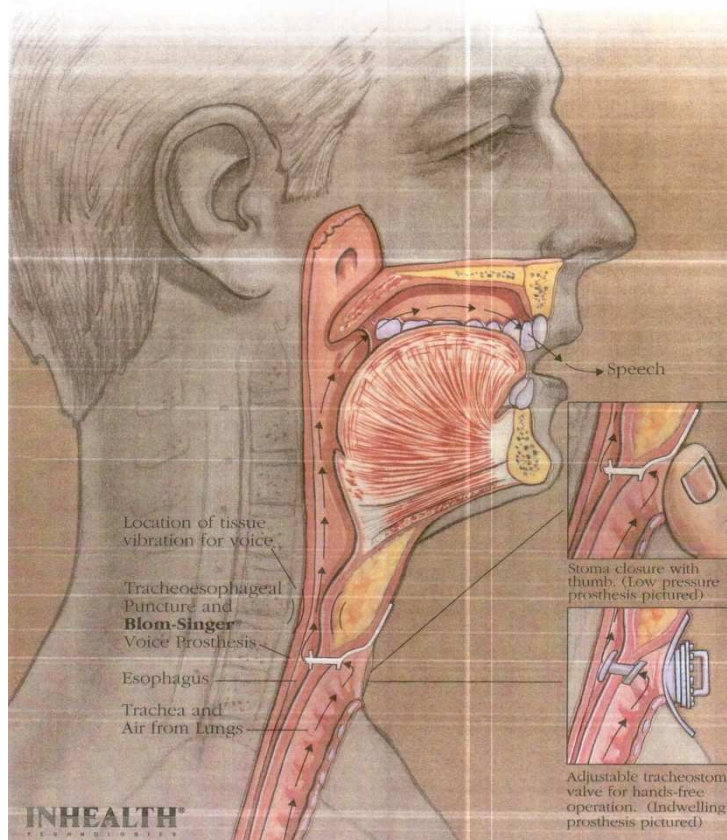
Tracheoesophageal Voice Prosthesis



INHEALTH

Blom-Singer®
voice restoration systems

Low pressure Voice Prosthesis



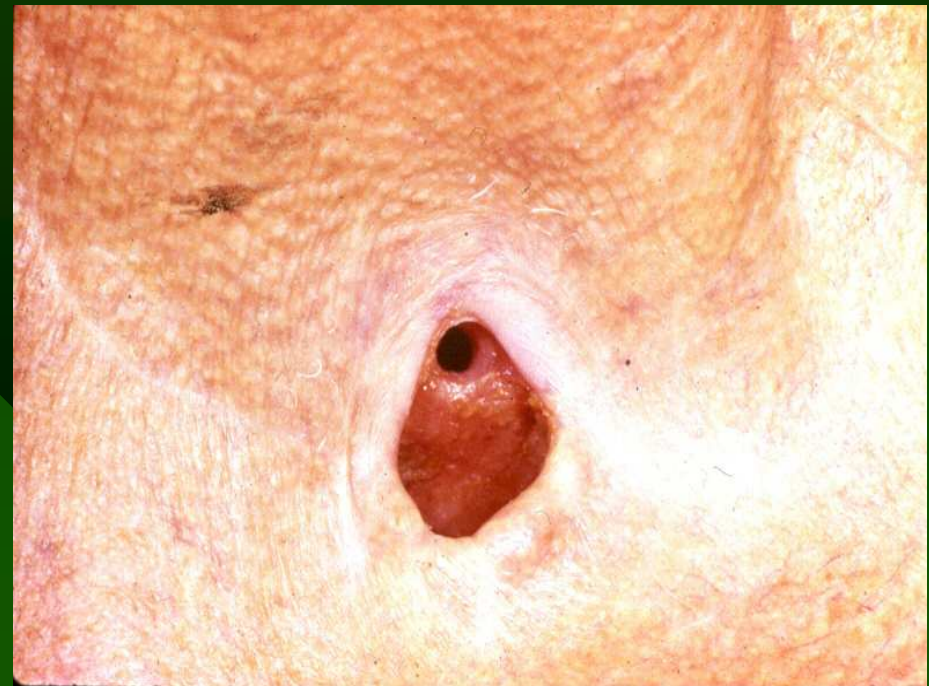
A small surgical passage is created just inside the stoma (from the back wall of the trachea into the esophageal wall)

A voice prosthesis can then be placed into this passage to enable tracheoesophageal speech.

Voice is produced by temporarily blocking the stoma, either with a finger or an adjustable tracheostoma valve, so that exhaled air from the lungs can be directed from the trachea through the prosthesis into the esophagus (where vibrations are produced) and then out through the mouth.

How to do the surgery

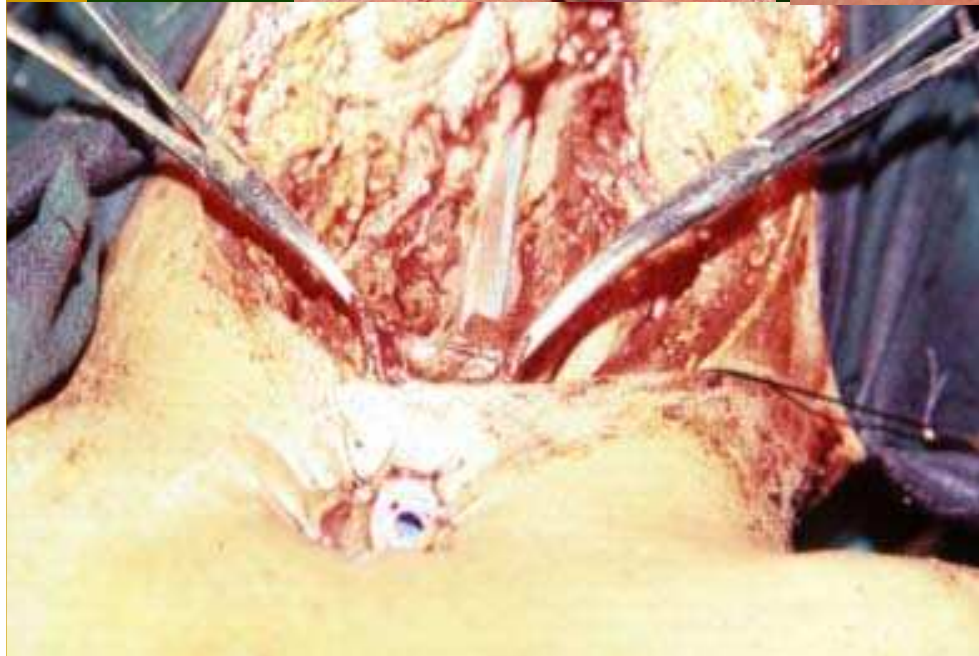
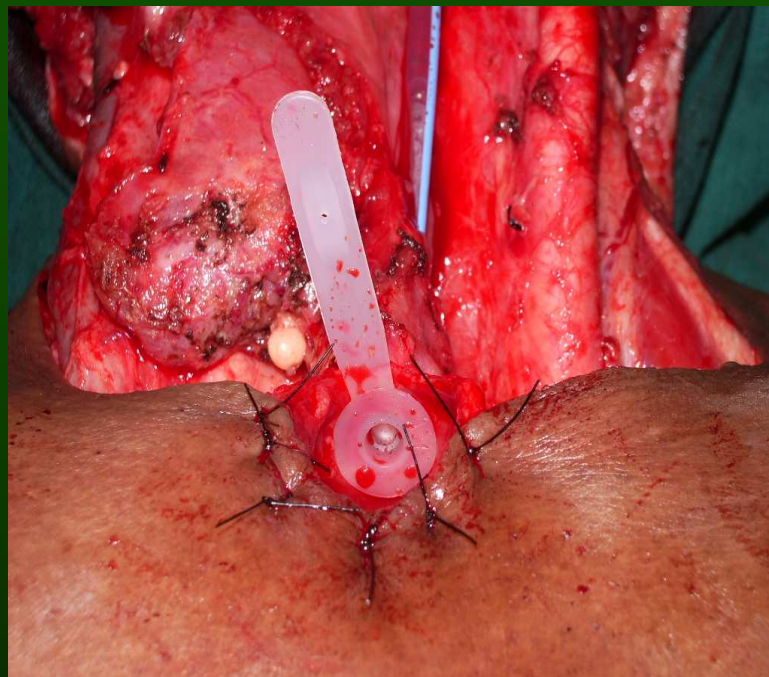
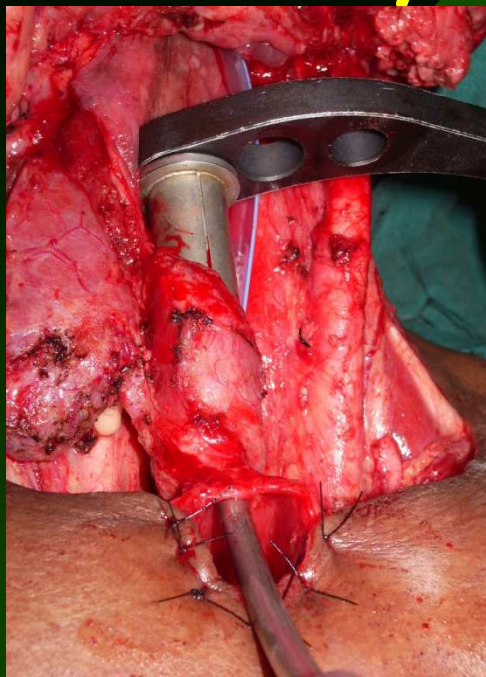
- ① makes a small hole in the rear of the stoma leading to the esophagus



② Once this puncture heals, a prosthesis is fitted and inserted into the opening



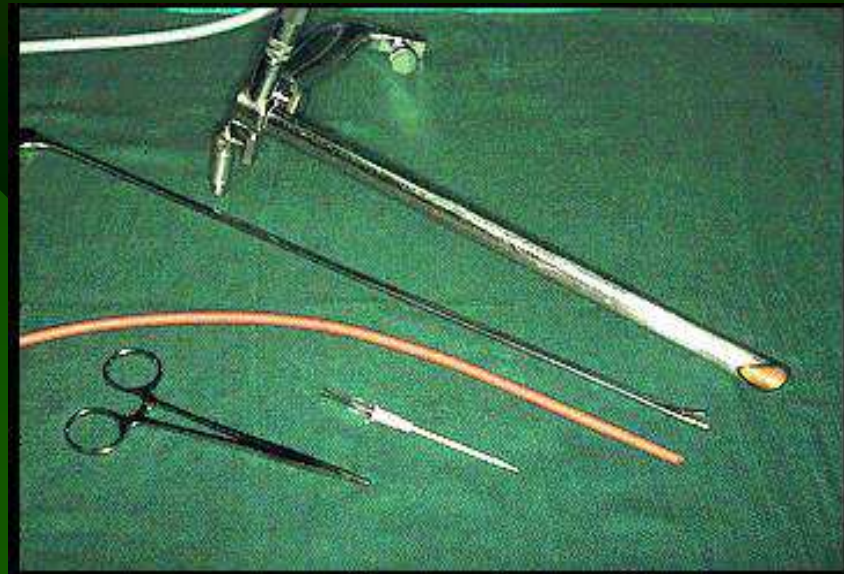
Primary Prosthesis Insertion



Secondary Prosthesis Insertion



TE surgical set

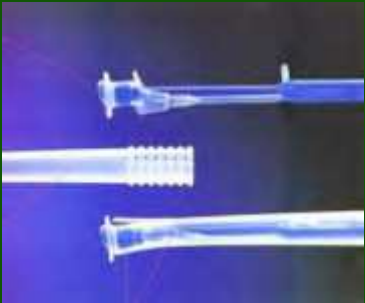
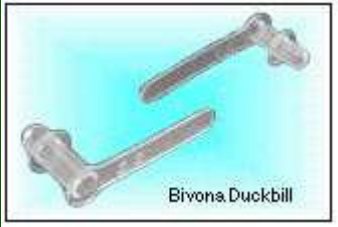
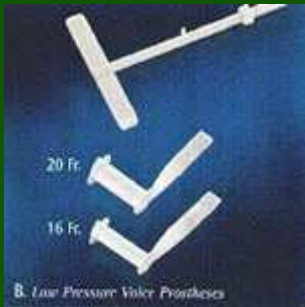
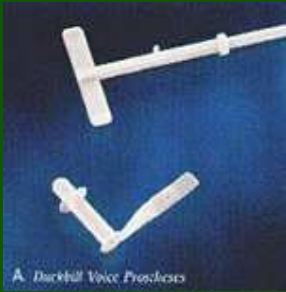
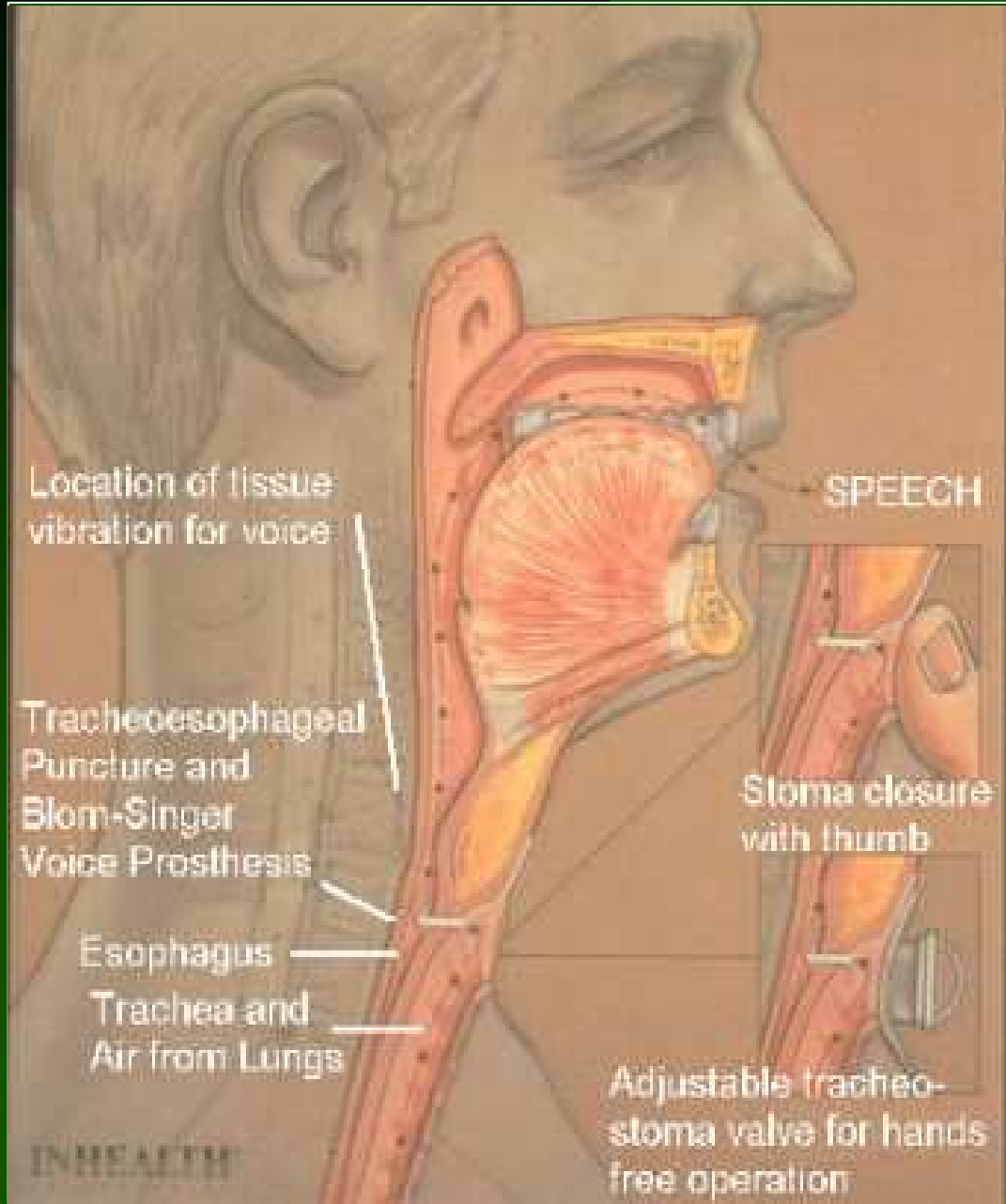
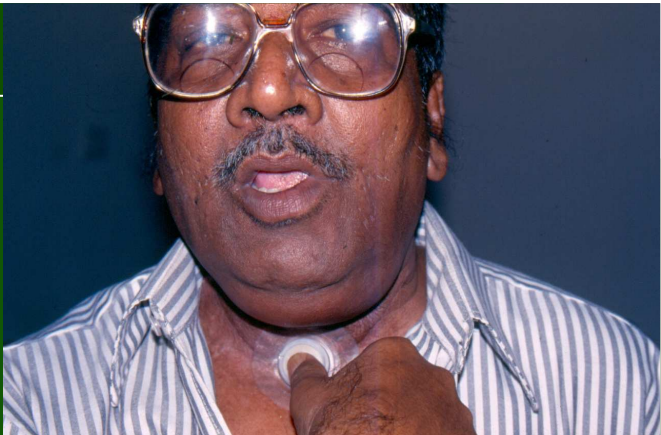


TE puncture



TE tract





Types of TEP's

INDWELLING

- Can stay in place for 3-6 months
- Requires SLP to remove/replace
- Less maintenance required
- Must have 2cm or greater tracheostoma
- Must pass esophageal insufflation test

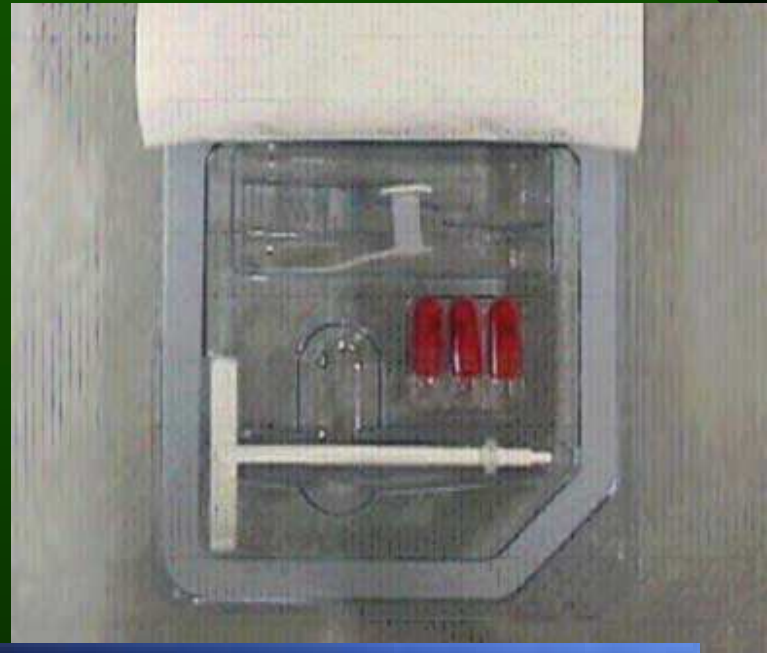
NON-INDWELLING

- Must be removed every 3-4 days
- Patient can change prosthesis independently
- More education is required for removal, cleaning ,etc.
- Must have 2cm or greater tracheostoma
- Must pass esophageal insufflation test

INDWELLING

Low pressure InHealth
prosthesis and
insertion tool with gel
caps

- clinician-placed voice prosthesis.
- This variant is designed for patients who have had a laryngectomy and are unable or unwilling to routinely remove, clean, and reinsert a patient-changeable voice prosthesis.



Advantages of Newer Generation Voice Prostheses

Indwelling

Longer device life

Wider lumen produces better speech quality

Can be directly inserted without prior stenting of TE fistula



PROVOX



Non-Indwelling Style (Patient Inserted)



16 Fr.
Duckbill

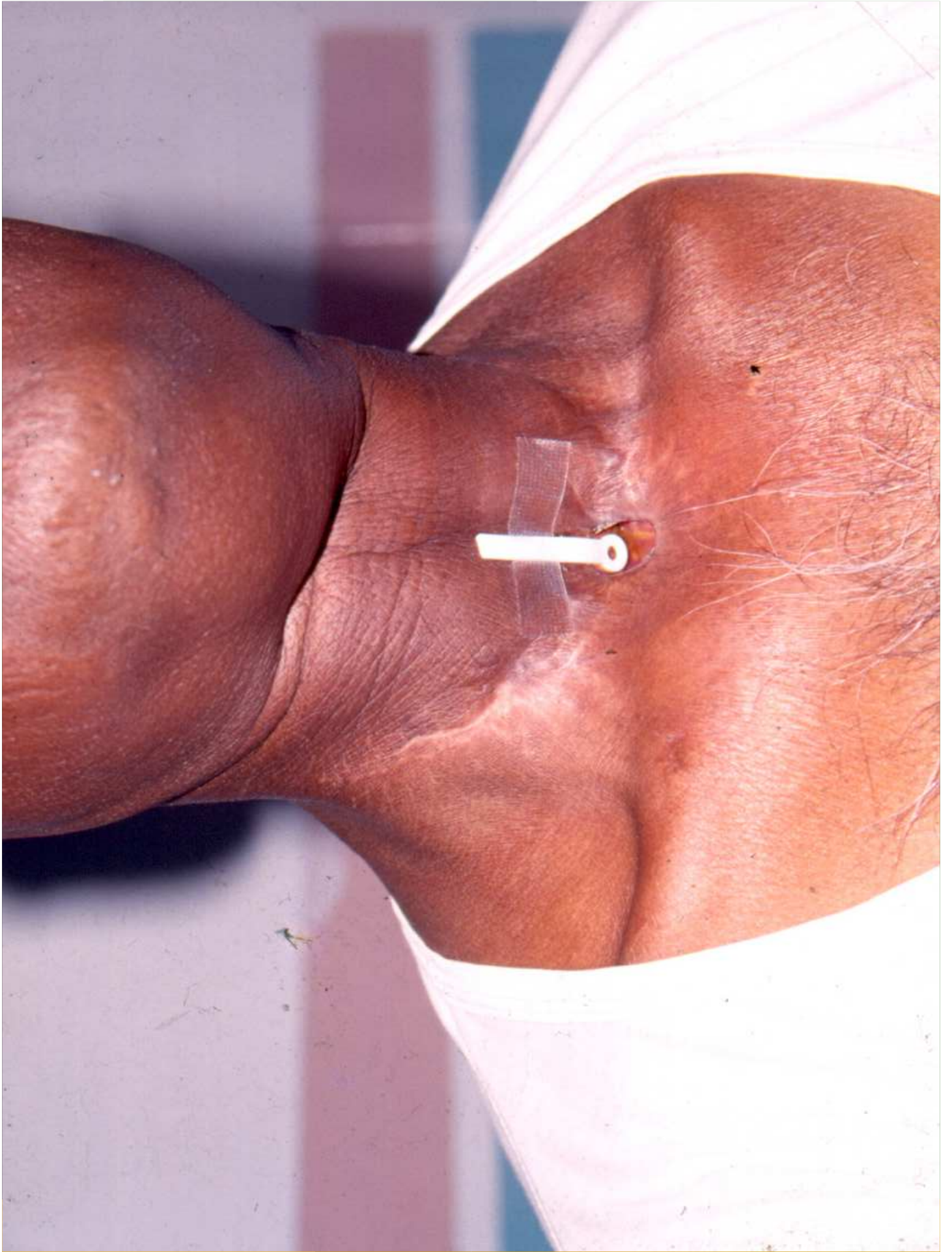
16FR
Low Pressure

20 FR
Low Pressure

NON INDWELLING

Blom-Singer
Prosthesis and
insertion tool





Patient Selection and Considerations

- Cognition
- Stoma size
- Respiratory restrictions
- Dexterity/Vision
- Cost

Stoma Size

- Too small
 - Non-indwelling vs. indwelling
 - Stoma revision
- Too large
 - Thumb vs. two-fingers
 - Hands-free valve



Respiratory Restrictions

- Emphysema/COPD
 - Non-indwelling; low pressure choice
 - Indwelling; larger French

Dexterity/Vision

- Non-indwelling
 - Insertion and removal
 - Family or caregiver assistance
- Indwelling
 - Cleaning and maintenance
 - Inserting a plug

Cost

- Non-indwelling 2-4 per year or more
- Indwelling 1-2 per year or less
- Hands-free valve
- Humidifiers
- Accessories - plugs, dilators

Pre-Testing

- Self Air Insufflation Test (Taub Test)
- Videofluoroscopy
- Patient selection
- Prior radiotherapy

Pre-Testing

- Self Air Insufflation Test
 - Patient identifies with vocal quality
 - Identifies PE spasms
 - Patient practices stoma occlusion
 - Identifies hyperactive cough reflex

Pre-Testing

- Videofluoroscopy
 - Identifies anatomical differences
 - Hypertrophic tissue
 - Confirms CP spasm
 - Sustained column of air
 - Upper vs. lower muscle fibers
- Videofluoroscopy
 - Using radioopaque device or lead marker
 - Identifies dysphagia if present
 - Fluid pouching in pseudovallecula
 - Solids collecting on hypertrophied tissue
 - Slow motility
 - Allows for intervention

Non-Indwelling & Indwelling Prostheses

- InHealth Technologies
 - Drs. Blom and Singer
 - Carpinteria, CA
- ATOS Medical Technology
 - Netherlands

Preparation for Placement

- Location
 - Preferably in Operatory room for initial placement.
 - Replacement can be done in the outpatient.

Preparation for Placement

- Why in O.R. treatment room?
 - May need suction.
 - Difficult to control the saliva swallow.
 - May have bleeding.
 - May need anesthetic.
 - Pain control.
 - May reduce cough reflex.

Preparation for RE-Placement

- Why in the outpatient ?
 - Replacement usually takes <10 minutes.
 - Removes the feeling that it's a medical procedure; a natural routine behavior, not unlike inserting contact lenses.

Placement Procedure

- Size the fistula.
- Place prosthesis.
- Elicit tone with prosthesis.
- Check water leakage with flashlight.

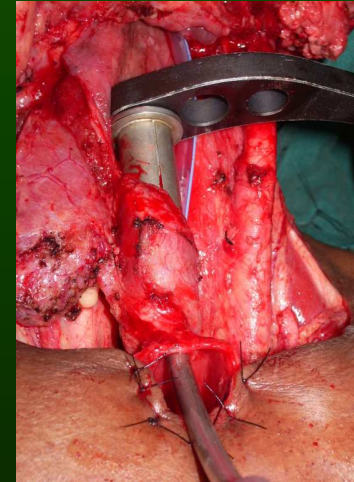


During Insertion

Primary insertion

Extent of pharyngectomy

Low cut margin of trachea



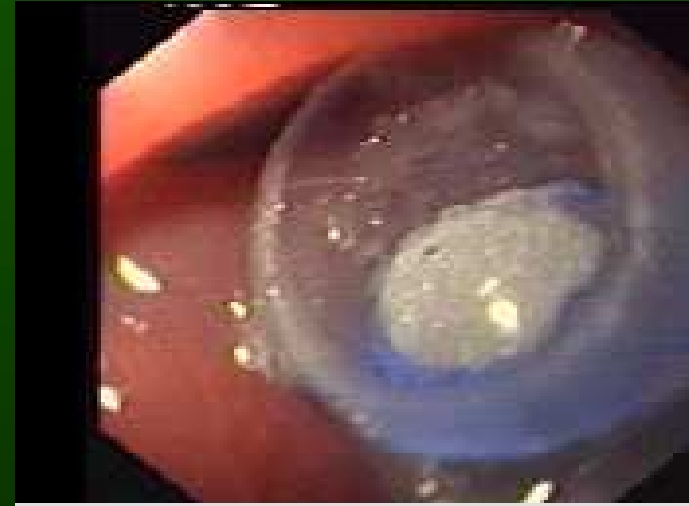
Secondary insertion

Pharyngeal stricture

Stomal stenosis



Post - Insertion



Prosthesis leakage

Leakage through prosthesis

Leakage around prosthesis

Leakage Around Prosthesis Causes

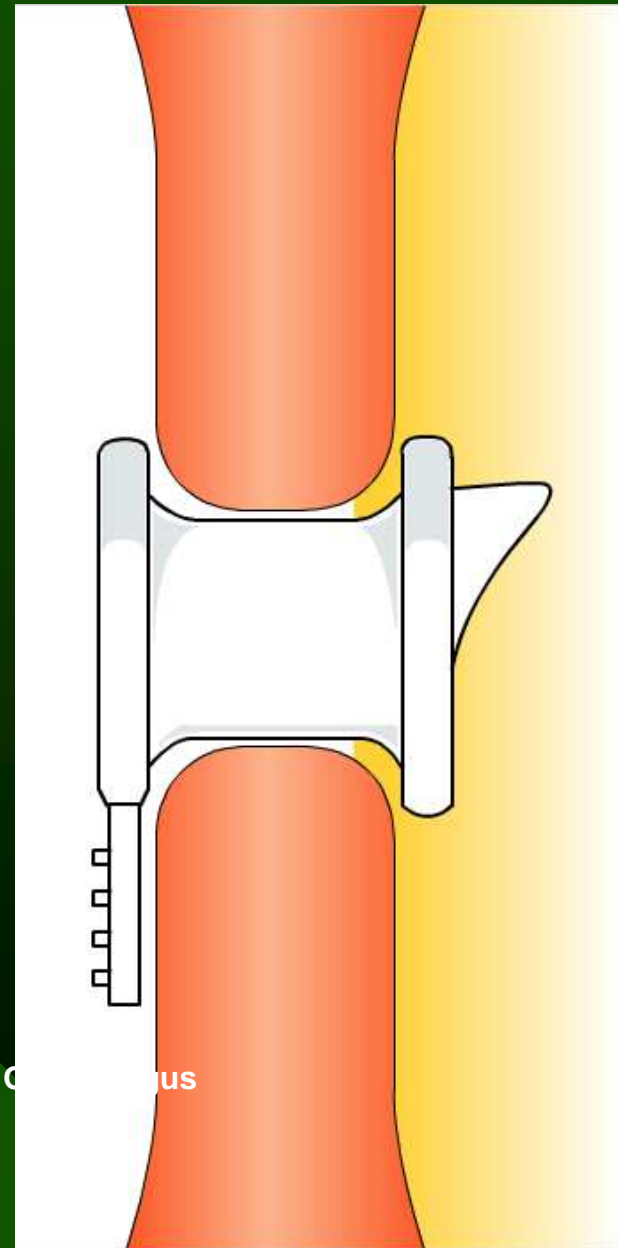
Movement of prosthesis due to size mis-match



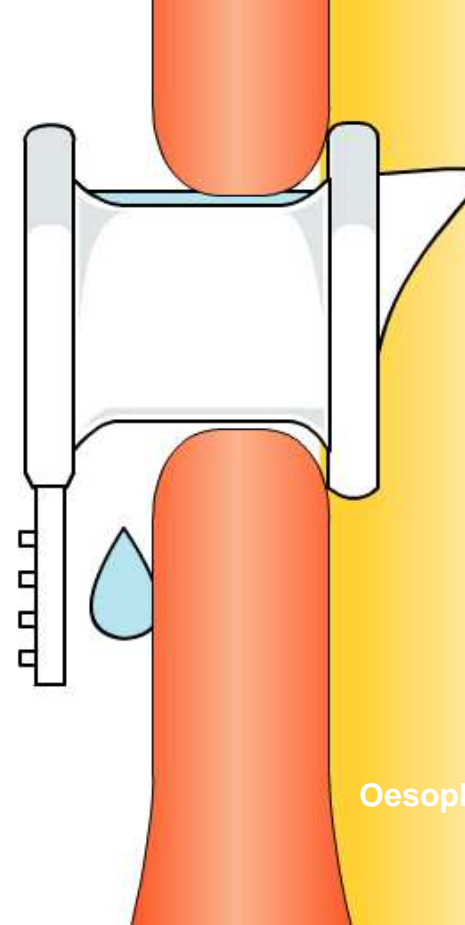
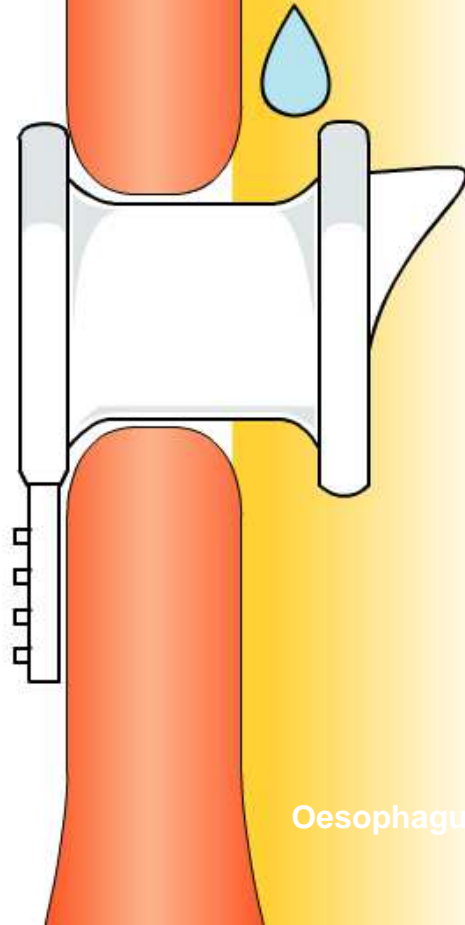
Widening of the T-E fistula

Correct position

Right diameter

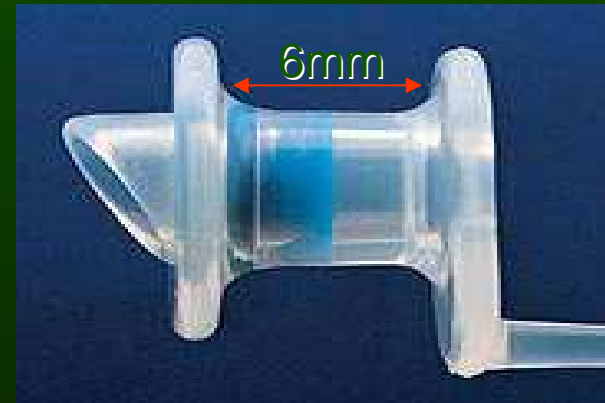


Leakage Around Prosthesis for wrong diameter



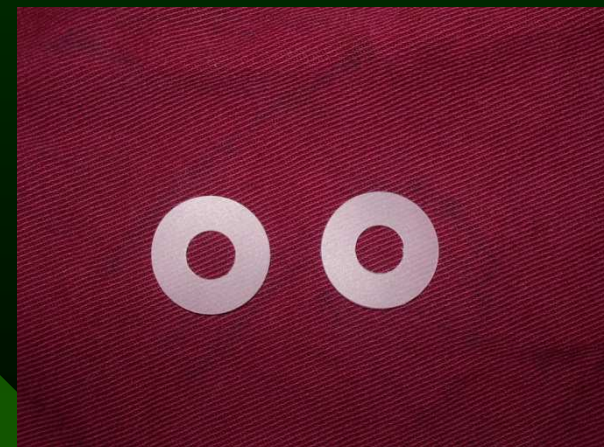
Leakage Around Prosthesis Management

Downsizing the prosthesis



Removal of prosthesis temporarily to allow the fistula to contract

Silicone sealing rings



In severe cases - surgical closure of T-E fistula

Hands-Free Speech



Replacement of prosthesis.

- The prosthesis, non-indwelling or indwelling, must be replaced when drops of ingested liquids begin to come through the TEP or around the outside.
- The patient should have the replacement possibility prosthetic handy.

REMOVAL OF OLD TEP

- Hemos were used to clamp and lock onto the TEP
- The TEP was gently pulled outward



INSERTION OF INDWELLING TEP

- A Blom-Singer Low Pressure indwelling prosthesis was inserted into the puncture site.
- A gel cap was used to provide aid in insertion, which dissolved within seconds, allowing the prosthesis to expand and adhere to the anterior esophageal wall
- The insertion flap was then removed by cutting it off with scissors



Post Placement Checklist

- Rotate 350 degrees.
- Try for phonation.
- Give sips of water to check for leakage.
- Try for phonation.
- Remove/cut off excess plastic.



Non-indwelling prosthesis.

- Pros: Cheaper, easy to clean and visualize, become easy to place.
- Cons: Harder to find, can be coughed out, need to carry extra prosthesis, and all of the items needed to maintain them. Harder to use with hands-free valve.

Indwelling prosthesis

- Pros: One insertion; can't be coughed out, can last for years, works better with the hands free valve.
- Cons: Expensive; if candida grows, it can be very expensive due to frequent replacement. Possible increased risk of granulation tissue, (rejection?).

TE Prosthesis

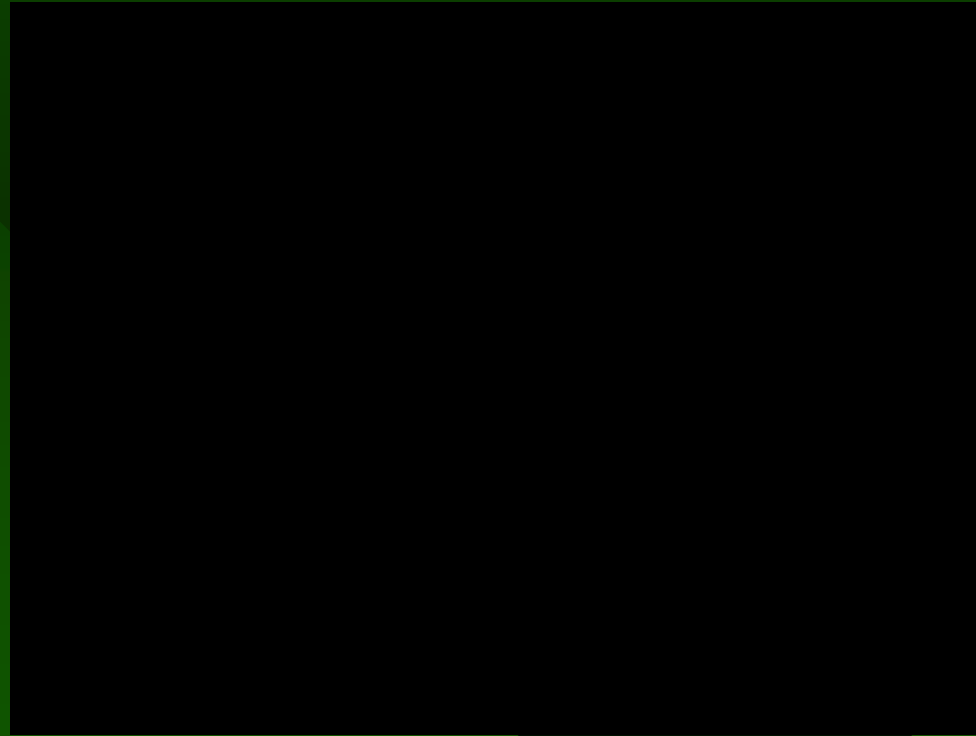


Maintenance

- Teach the patient to clean and maintain the prosthesis.
- Alert the patient as to leakage and the need to replace the prosthesis.
- Have the patient purchase a replacement.

Conclusion:

- When the TEP works, (70% success rate), it's fabulous.



- When it doesn't, it's a nightmare.

PROBLEMS

- When to call:
 - The TEP VP has become dislodged.
 - The pt is having difficulty talking or is unable to talk and flushing the prosthesis does not improve voice quality.
 - The TEP VP is leaking either through or around the device.
 - The TEP VP is fitting too long or too short (flange is not fitting flush against the TEP).

Comparison

Esophageal speech	Electrolarynx (EL)	Tracheoesophageal Puncture (TEP)
needs to train	no much needs to train	does not need to train
both hands to be possible to move freely, and can work while speaking	both hands not to be possible to move freely, cannot work while speaking	single-handed to be possible to move freely, only can work with single-handed when speaking
can speak in everywhere	need mechanism	can speak in everywhere
spoken language is clarity and good	spoken language is not clarity and good	Spoken language is clarity and good
sound not loud	sound loud	sound loud
easy weary	not weary	not weary
not to inhale in wrong way	not to inhale in wrong way	easy to inhale in wrong way

Total Laryngectomy - Voice options

	Tracheo- Esophageal Voice Prosthesis (TE)	Electrolarynx (EL)	Esophageal speech (ES)
Quality of voice.	Voice quality is usually better quality than EL or ES.	Vocal quality is mechanical/unnatural.	Vocal quality is better than EL, but less than TE.
Vocal intensity.	Vocal intensity is better than ES, but variable	Usually louder than TE or ES.	Softer vocal intensity than TE or EL.
Adaptability/ Rate of success.	High success rate, easy to learn.	Fairly high success rate, easy to learn.	Usually the lowest success rate among all three, relatively difficult to learn.

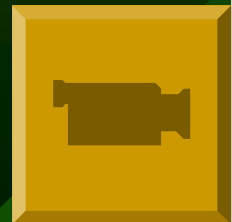
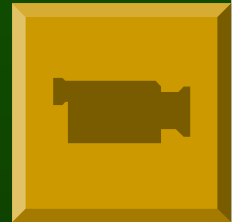
Good -

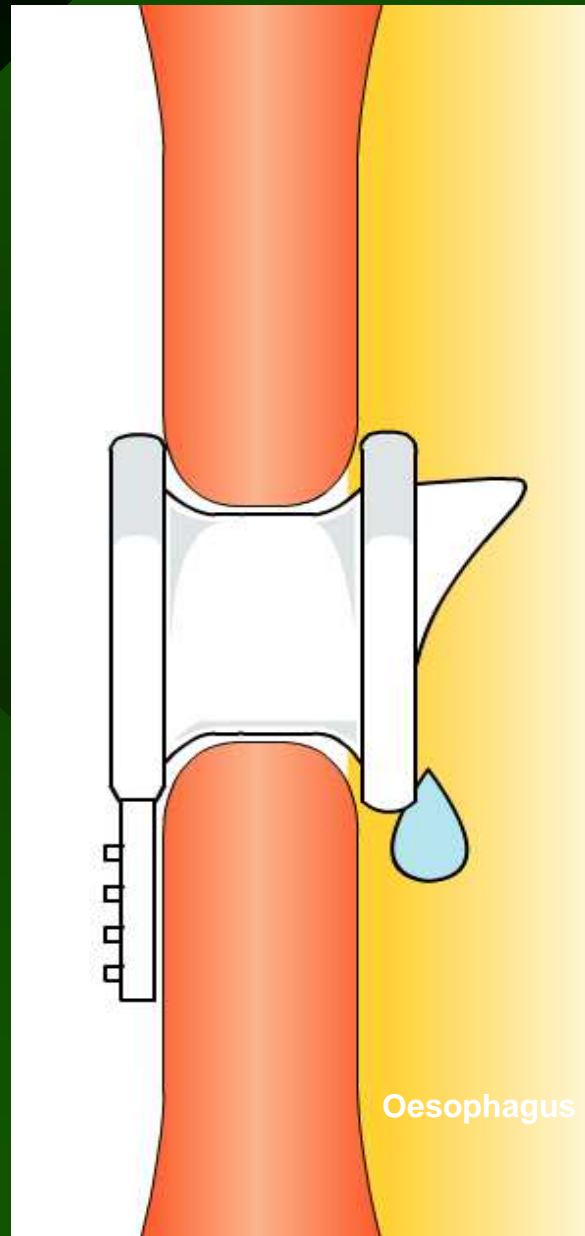


Fair -



Poor -

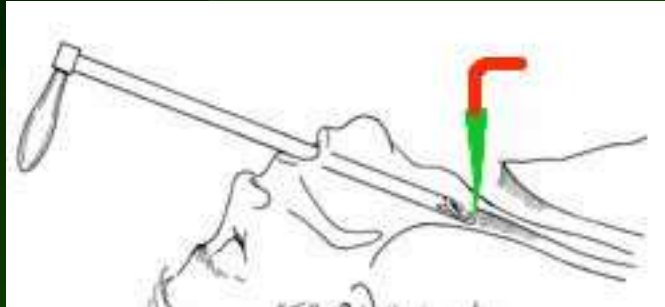




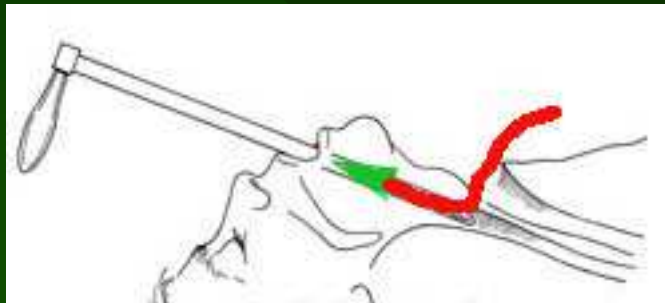
Oesophagus



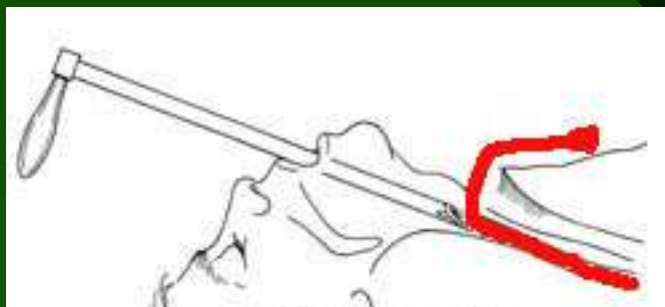
How is our device used?



Puncture hole made with our device



Forceps used to pull device through esophagoscope



Device removed and catheter forced back down esophagus