Phonosurgery

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Phonosurgery

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Phonosurgery

- Esthetic surgery of the vocal organs.
- The surgical techniques designed primarily for the improvement or restoration of voice.
- The term is firstly adopted by Godfrey Arnold and Hans von Leden in (1971)
Evaluation of Voice Disorders

A thorough assessment is essential.

Subjective and objective measures.
Pre and postoperative settings.

I. Elementary Diagnostic Procedures

II. Clinical Diagnostic Aids.

III. Additional Instrumental Measures.

I. Elementary Diagnostic Procedures

- Patient’s interview.
- Auditory Perceptual Assessment. (APA)
- Visual assessment of the vocal tract.
- External laryngeal examination.

II. Clinical Diagnostic Aids.

Indirect laryngoscopy & Videostroboscopy.
Rigid telescope or nasofibroscope.
Evaluation of Voice Disorders

III. Additional Instrumental Measures.

- Acoustic analysis.
- Aerodynamic analysis.
- Electromyography.
- Glottal wave studies:
  - Electroglottography (EGG).
  - Photoglottography (PGG).
  - Inverse filtering technique.
  - Videokymography.
- Radiological Studies
  - Plain X-ray.
  - CT scanning.
  - MRI.
  - Videofluoroscopy.

Goals:

- Aetiological categorization of the pathology.
- Determine the nature and severity of the disorder.
- Choice the type and sequence of intervention.
- Drawing prognostic anticipation.
- Monitoring the effect of intervention.

(Kotby et al., 1989)
Phonosurgery

Kotby's classification (1995)
1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation.
3. Vocal fold repositioning.
5. Glottal reconstruction after partial laryngectomy.

Prof. Rosemarie Albrecht - Germany (1954) described the first microscopic visualization of the Vocal Folds.

Prof. Oskar Kleinsassar - Germany (1962) introduced the modern state of the art method of microlaryngosurgery.

Dr. Geza Jako – USA (1962) designed a series of microlaryngeal instruments.
Extirpation Endolaryngeal Microsurgery

- Instrumentation (conventional microsurgery) / CO2 laser.
- Indication:
  
  **Congenital Lesions:**
  - Sulcus vocalis & vergeture.
  - Epidermoid cysts & laryngocyesles.

  **Acquired lesions**
  - MAP lesions.
  - VF hemorrhage.
  - Dysplasia of VF. & Carcinoma in situ.
  - Laryngeal web
  - Laryngeal stenosis
  - Granulomata.
  - Papillomatosis.
  - Benign neoplasm

Laser Phonosurgery

- Safety precaution.
- Benefits.
- Limitations.
- Indications:
  - Thin webs.
  - Multiple papillomatosis.
  - Contact granuloma.
  - Dysplasia.
  - Cordectomy for early malignancy.
1. Extirpation endolaryngeal microsurgery.
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**Phonosurgery**

**Vocal Fold Augmentation**

*Wilhelm Brunings* (1911) developed the first technique by injecting paraffin using a special syringe.

- Autologous and alloplastic materials.
- Transoral or percutaneous approaches.
Vocal Fold Augmentation

- **Indications:**
  Correction of glottic incompetence due to:
  - Unilateral vocal fold paralysis.
  - Sulci or after surgery or trauma. *(Hirano, 1989)*

- **Contraindication:**
  - Mobile or potentially mobile VF.
  - CA joint fixation.
  - Post-hemilaryngectomy.
  - Inflammatory diseases and medical conditions.

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Vocal Fold Augmentation

**The ideal bio-injectable**

- should be biologically well tolerated, biocompatible.
- Easily handled and easily injected.
- Resistant to resorption after injection.
- should not interfere with mucosal vibration.
- should be easily reversible. (explantable)
- should not migrate from the site of injection.
- Lack of donor-site morbidity.
Vocal Fold Augmentation

- *Schramm et al.* (1978) used gelfoam/glycerin paste.
- *Ford and Bless* (1986) used bovin collagen.

**Biocompatible substances** are used not only to medialize the vocal fold but also to help restore its viscoelastic properties as well.

- Expanded polytetrafluoroethylene. (ePTFE)
- Cross-linked hyaluronic acid (Hylaform).
- Micronized acellular human dermis. (Cymetra)
- Calcium hydroxyapatite. (Radiance FN)
- Polydimethylsiloxane. (Bioplastique).
Vocal Fold Augmentation

**Autologous fat injection**

- **Harvesting and processing:**
  - Liposuction alone.
  - Lipo-structure procedure / purification. *(Cantarella et al., 2003)*
- **Site of injection**
  - In the membranous FV *(Mikaelian, 1991, Brandenburg 1992).*
  - In oblong pit of arytenoid. *(Umeno, 2003)*
- **Unpredictable resorption.**

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**Phonosurgery**

1. Extirpation endolaryngeal microsurgery.
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Repositioning of the Vocal Fold

- **Medialization surgeries** *(Mediopexy)*
  1. Surgical augmentation
  2. Arytenoid adduction

- **Lateralization** *(Lateropexy)*
  1. Arytenoid repositioning. *(Ejnell, 1984)*
  2. Arytenoidectomy with posterior partial cordectomy.
     Sharp dissection *(Kleinsasser, 1968)*
     Laser excision. *(Ossff et al. 1984)*

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Repositioning of the Vocal Fold

- **Medialization surgeries** *(Mediopexy)*

  1- **Surgical augmentation**
     - **Materials:**
       autograft cartilage or alloplastic implant.
     - **Techniques:**
       - Anterior approach. *(Meurman, 1952)*
       - Anteroinferior approach. *(Hiroto, 1976)*
       - Window technique. *(Isshiki, 1977, Kaufman, 1986)*
Repositioning of the Vocal Fold

- **Medialization surgeries** (Mediopexy)
- **2- Arytenoid adduction** *(Isshiki, 1978)*
  - Traction of the muscular process of the arytenoid antero-medio-inferiorly.
  - It can be augmented by simultaneous thyroplasty IV.

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Laryngeal Framework Surgery

**Thyroplasty**

- **Payr** (1915) reported the first medialization procedure by anteriorly based cartilage flap.
- **Meurman** (1952) implanted free rib grafts beneath the inner thyroid perichondrium.
- **Opheim** (1955) placed thyroid cartilage medial to the inner perichondrium.
- **Montgomery** (1966) repositioned the arytenoid and fixed it to the cricoid cartilage with a pin.
- **Isshiki et al** (1975) achieved medialization by displacing and stabilizing a rectangular window at the level of VF.
- **Kaufman** (1986) derived a formula for calculating the appropriate size of the window.
Laryngeal Framework Surgery

- Altering VF position, shape and tension by manipulating the cartilagenous framework.
- Isshiki’s functional classification:
  Type I - Medialization.
  Type II - Lateralization.
  Type III - Relaxation (shortening).
  Type IV - Stretching (lengthening).

Thyroplasty type I - Medialization

Compressing the VF by the medial displacement of a rectangular musculo-cartilagenous flap of the thyroid cartilage with the attached periosteum and TA muscle.

**Indication:**
- UVFP
- Bowing of the VF.
Laryngeal Framework Surgery

- **Type II - Lateralization**
  
  Release the tight closure of the glottis.

  **Approaches:**
  
  - A vertical incision in the thyroid cartilage and lateralizing the posterior segment over the anterior one.
  - Two paramedian vertical incisions and interpose the lateral segments beneath the anterior segment.

  **Indication:**
  
  Spastic dysphonia.

Laryngeal Framework Surgery

- **Type III - Relaxation (shortening)**
  
  Aimed at lowering the vocal pitch.

  The VF is relaxed by A-P shortening of the thyroid ala.

  **Indications:**
  
  - Males with high pitch voice, resistant to voice therapy.
  - Stiff VF with high pitched breathy voice.
  - Spastic dysphonia.
Type IV - Stretching (lengthening)

CT approximation to elevate pitch.

Indications:
- Bowed FV.
- Androphonias.

Techniques to elevate the pitch:
- Inferiorly based anterior cartilage flap.
  (LeJeune et al., 1983)
- Superiorly based cartilage flap.
  (Tucker, 1985)
- Anterior commissure advancement.
  (LeJeune et al., 1987)
Compression Tests (Broditz test)

1. Lateral Compression test
2. Cricothyroid Approximation
3. Combined LCT & CT approx.
4. Anteroposterior Compression

Phonosurgery

1. Extirpation endolaryngeal microsurgery.
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5. Postlaryngectomy surgery.
Neurophonosurgery

- **Reinnervating the PCA muscle**
  - Nerve anastomosis. Phrenic nerve /ansa cervicalis.
  - Phrenic nerve implantation. *(Crumley, 1983)*
  - Neuromuscular pedicle Transplantation. *(Tucker, 1977)*

- **Reinnervating the TA muscle**
  - Ansa cervicalis to RLN anastomosis. *(Crumley, 1991)*
    - Infrathyroid - suprathyroid techniques
  - Neuromuscular pedicle Transplantation. *(Crumley, 1985)*

Phonosurgery

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Reconstructive Phonosurgery

Reconstruct the resected VF after partial or hemilaryngectomy.

- Hirano et al. (1976) used the sternothyroid muscle covered by an island flap of the overlying neck muscle.
- Friedman et al. (1985) utilized the contralateral superior thyroid cornu.
- El Kahky et al. (1989) used the ipsilateral pyriform sinus mucosal flap with intact superior laryngeal neurovascular bundle.

Phonosurgery

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5. Postlaryngectomy surgery.
Postlaryngectomy Surgery

Shunting the tracheal air to the pharynx or esophagus.

- **Neoglottis.** TE mucosal lined canal.

  (Conley et al., 1958;  Asia, 1972;  Staffieri and Serafini, 1976;  Roka et al., 1985)

- **Voice Prothesis** in TE puncture.

  Blom-Singer voice prothesis. (Blom et al., 1982)
  Panje voice button prothesis. (Panje et al., 1981)
Vocal Fold Nodules

Female – 44 years
Vocal Fold Polyp

Female – 24 years
Female – 22 years

Vocal Fold Cyst
Male – 55 years

Reinke’s Edema
Female – 33 years

Intubation Granuloma
Female – 25 years

Female – 15 years
Male – 43 years
Male – 33 years

Thank you