



# Phonosurgery

Moderator

*Prof. Yehia Aboras*

Professor of Phoniatics

ENT Department - Alexandria University

# Phonosurgery

Moderator

*Prof. Yehia Aboras*

Panelists

*Prof. Nasser Kotby*

*Prof. Gross Manfred*

*Prof. Hesham Abdel Fattah*

*Prof. Yassin Bahgat*

*Prof. Ahmed Tantawy*

*Prof. Mohamed Hesham*

# 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.

# Evaluation of Voice Disorders

## 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.

# Evaluation of Voice Disorders

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

(Kotby et al., 1989)

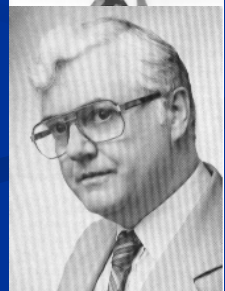
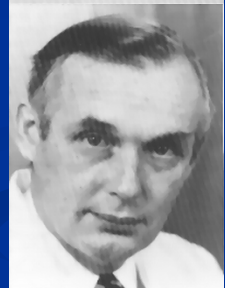
# Phonosurgery

## Kotby's classification (1995)

1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation.
3. Vocal fold repositioning.
4. Neurophonosurgery.
5. Glottal reconstruction after partial laryngectomy.
6. Postlaryngectomy surgery.

## Extirpation Endolaryngeal Microsurgery

- ❖ 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 & laryngocyceles.
- Laryngeal web
- Laryngeal stenosis

### Acquired lesions

- MAP lesions.
- VF hemorrhage.
- Dysplasia of VF. & Carcinoma in situ.
- Granulomata.
- Papillomatosis.
- Benign neoplasm

## Extirpation Endolaryngeal Microsurgery

### Laser Phonosurgery

- Safety precaution.
- Benefits.
- Limitations.
- Indications:
  - Thin webs.
  - Multiple papillomatosis.
  - Contact granuloma.
  - Dysplasia.
  - Cordectomy for early malignancy.

# Phonosurgery

1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation
3. Vocal fold repositioning.
4. Neurophonosurgery.
5. Glottal reconstruction after partial laryngectomy.
6. Postlaryngectomy surgery.

## 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.

# 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

- *Arnold* (1961) used teflon.
- *Fukuda* (1970) used silicon.
- *Schramm et al.* (1978) used gelfoam/glycerin paste.
- *Ford and Bless* (1986) used bovin collagen.
- *Brandenburg et al.* (1992) used autologous fat injection.
- *Ford et al* (1995) used autologous collagen.
- *Tsunoda et al.* (2001) implant harvested temporalis fascia.

# Vocal Fold Augmentation

**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.**

# Phonosurgery

1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation.
3. Vocal fold repositioning.
4. Neurophonosurgery.
5. Glottal reconstruction after partial laryngectomy.
6. Postlaryngectomy surgery.

# 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)

# Repositioning of the Vocal Fold

## ■ Medialization surgeries (Mediopexy)

### 1- Surgical augmentation

#### ➤ Materials:

autograft cartilage or alloplastic implant.

#### ➤ Techniques:

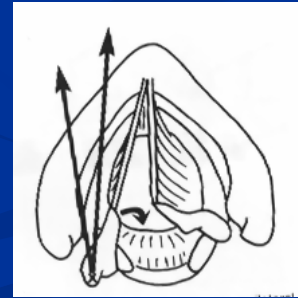
- Anterior approach. (Meurman, 1952)
- Anteroinferior approach. (Hiroto, 1976)
- Window technique. (Isshiki, 1977, Kaufman, 1986)

# 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.



## 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).



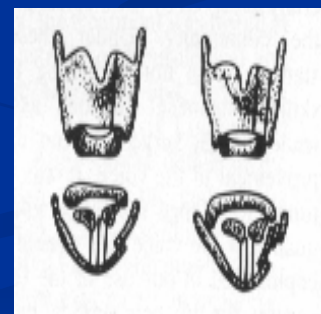
# Laryngeal Framework Surgery

- **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

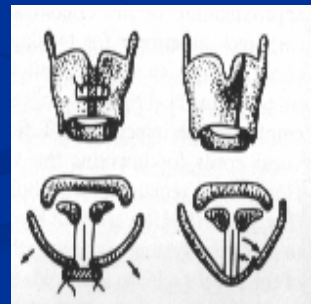
Release the tight closure of the glottis.

### 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.



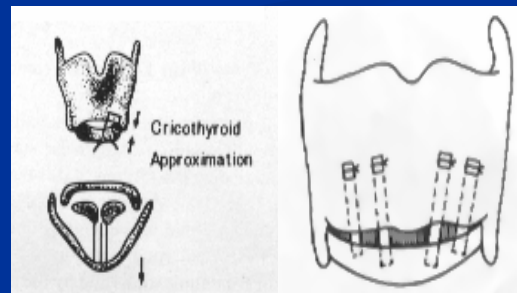
# Laryngeal Framework Surgery

## ■ Type IV - Stretching (lengthening)

CT approximation to elevate pitch.

### Indications:

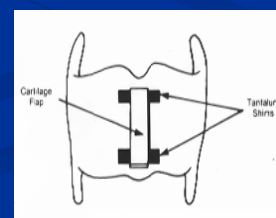
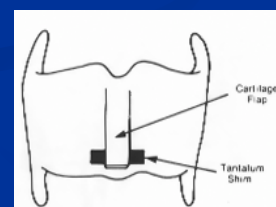
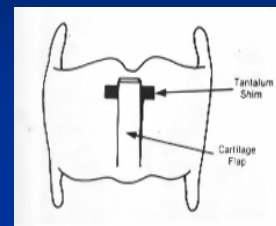
- Bowed FV.
- Androphonias.



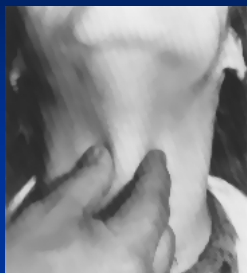
# Laryngeal Framework Surgery

## 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)



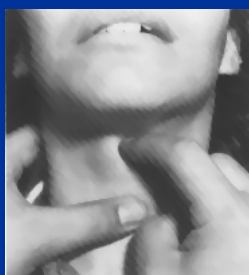
## Compression Tests (Brodnitz test)



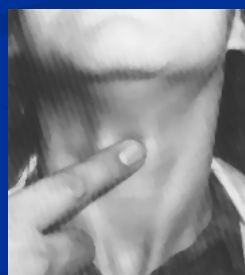
Lateral Compression test



Cricothyroid Approximation



Combined  
LCT & CT approx.



Anteroposterior Compression

## Phonosurgery

1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation & repositioning.
3. Neurophonosurgery.
4. Glottal reconstruction after partial laryngectomy.
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

1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation & repositioning.
3. Neurophonosurgery.
4. Glottal reconstruction after partial laryngectomy.
5. Postlaryngectomy surgery.

# 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

1. Extirpation endolaryngeal microsurgery.
2. Vocal fold augmentation & repositioning.
3. Neurophonosurgery.
4. Glottal reconstruction after partial laryngectomy.
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)

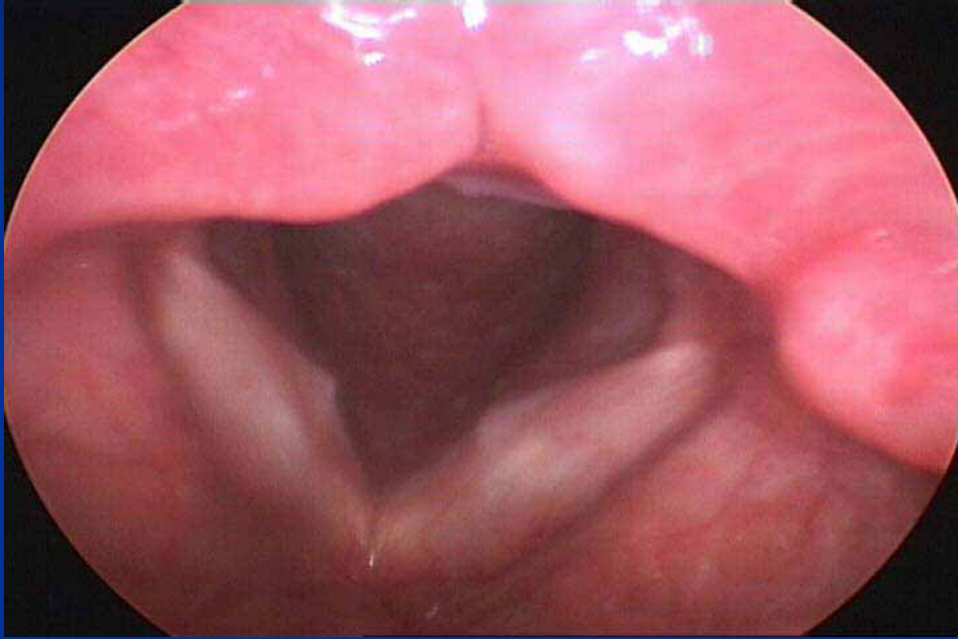
- **Voice Prosthesis** in TE puncture.

Blom-Singer voice prosthesis. (Blom et al., 1982)

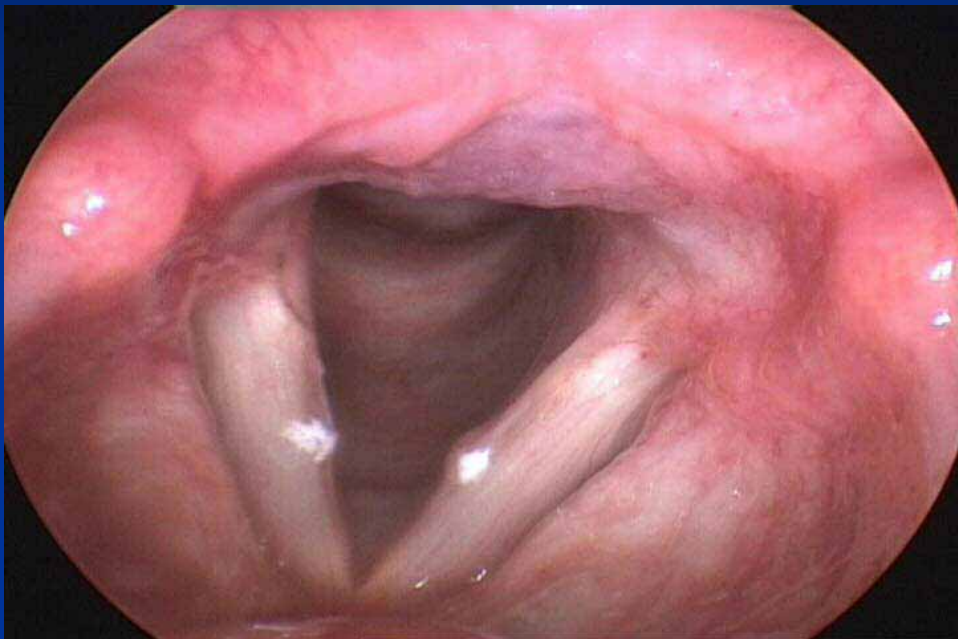
Panje voice button prosthesis. (Panje et al., 1981)



Female – 32 years



Female – 33 years



# Vocal Fold Nodules



Female – 44 years



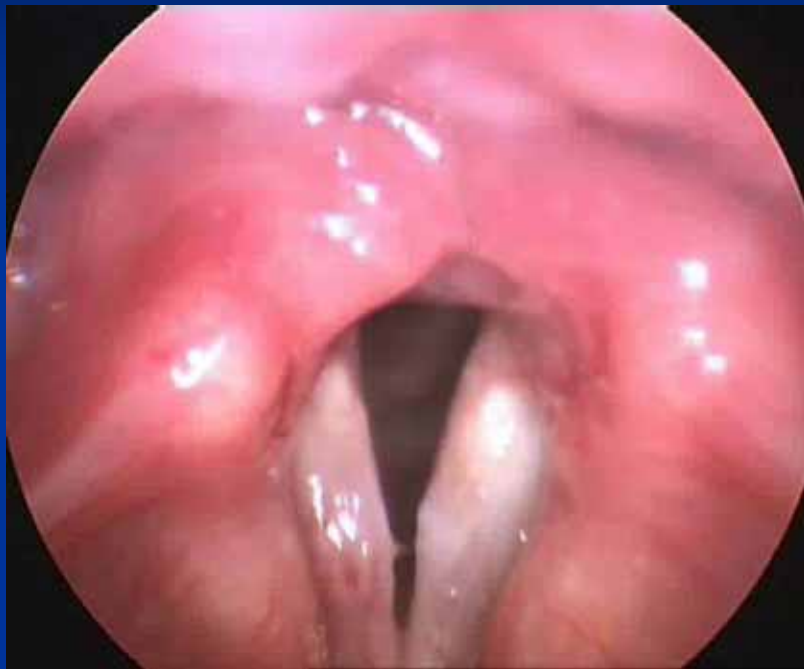
# Vocal Fold Polyp



Female – 24 years



Female – 22 years



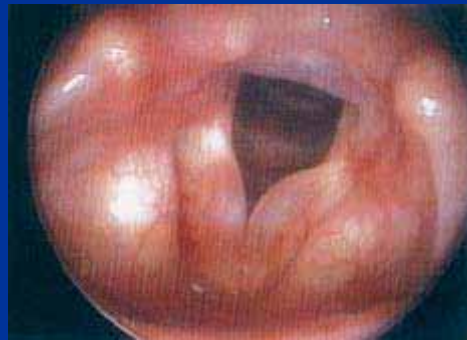
Vocal Fold Cyst



Male – 55 years



Reinke's Edema





Female – 33 years



Intubation Granuloma



Female – 25 years



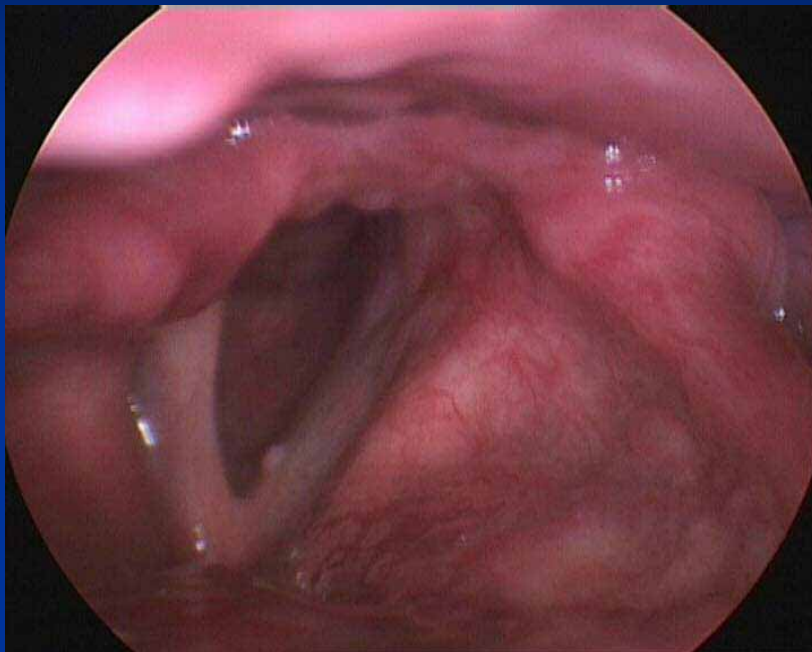
Female – 15 years



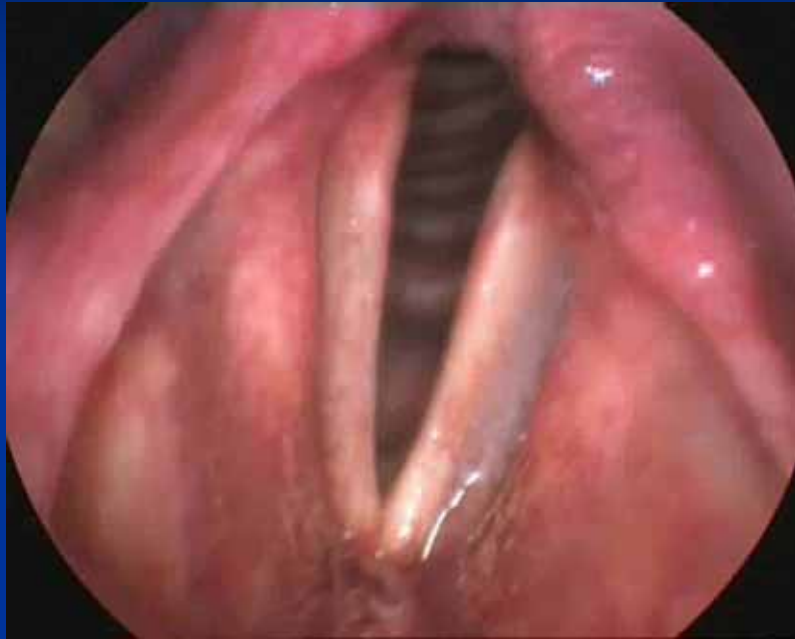
# Sulcus Glottideus



Male – 20 years



Male – 58 years



Female – 43 years





Male – 43 years



Male – 33 years



*Thank you*