Anatomical and Biomechanical Analysis of the Human Recurrent Laryngeal Nerve - an experience in general ENT surgery

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2016 UEP, Bilbao
The study was undertaken following approval from the ethical committee (Semmelweis University, Regional and Institutional Committee of Science and Research Ethics; TUKEB No. 127/2014) and in accordance with the declaration of Helsinki, using the National Research, Development and Innovation Office – NKFIH, OTKA K-116189 grant.
Voices of the world
„What is spoken of as a „clinical picture” is not just a photograph of a sick man in bad; it is an impresionistic painting of the patient surrounded by his home, his work, his relations, his friends, his joys, sorrows, hopes and fears.”

Francis Weld Peabody 1927
The aim of the presentation:

I. To clinically and culturally illustrate the importance of the recurrent laryngeal nerve

II. To present the usual anatomy in a Hungarian population

III. To demonstrate our findings in a Hungarian population related to biomechanical forces
HRLN

- Motor and sensory fibers
- Innervating intrinsic muscles /except the cricothyroid/
- Sensation in the glottic and subglottic areas
- Uni-/ bilateral vocal fold palsy
- VFP≠VFI /more frequent in adults/
- VFI: tumor, arthrosis, subluxation
VFP

• Consequences:
  – Phonation
  – Deglutition
  – Respiration
  – QoL

• Anatomical factors:
  – Position, course, length, branching, neighbouring structures
  – IL>IR, subclavian artery-aortic arch
VFP

• Causes:
  – Surgery, intubation, trauma, tumor
  – Thyroid, carotid, cervical spine, esophagus

• Protective factors:
  – Epi- and perineural sheets, collagen, vessels, tracheoesophageal groove, fat
  – Experience of the surgeon, nerve monitoring
Complex anatomy

Facial artery

Collateral from the buccal branch

Zygoma

MMB

Submandibular gland

Lingual artery

Carotids

XII.
Anatomy, right nLR I.

- Thyroid gland
- Trachea
- nLR, right
Anatomy, right nLR II.
Anatomy, right nLR III.
Antomy, left nLR I., branching
Anatomy, left nLR II., vascular
Antomy, left nLR III., traction
Antomy, left nLR IV., mobilised
Antomy, both nerves I.
Antomy, both nerves II.
Antomy, case example I., thyroglossal duct
Antomy, case example II., left unilateral goiter
Infection
Infection leading to surgery I.
Infection leading to surgery II.
Surgery II.
Surgery III.
Surgery IV.
Mechanical lesions

I. NEUROPRAXIA
II. AXONOTMESIS /axons, Wallerian degeneration!/
III. NEUROTMESIS /endoneural tubules/
IV. PERINEURAL TEAR
V. TOTAL TEAR

/I.-III. by compression, IV.-V. no total recovery without surgery/

Lesions I.
Lesions II.
Lesions III.
Lesions IV.
Results I.

- 10 specimens exposed to tensile test
- Ex-vivo
- Female
- 70y (67-73)
- 68kg (54-90)
- 158cm (150-162)
- No local or general pathologies compromising
- Death due to a cardiorespiratory event
Results II.

- Parallel segments of the same length
- Disruption occurred differently
- No L-R symmetry of the same defunt detected by stereomicroscopy
- Specimens of at least 4.5 mm long
- Mean elongation R $7 \pm 2$ mm
- Mean elongation L $10 \pm 3$ mm
Results III.

• No correlation of the mean diameter and elongation

• No correlation of the mean diameter and maximal load

• Higher elongation on the left
CONCLUSIONS

- Anatomy is usually respected but:
  - Several branches are usually present
  - The thyroid gland and vascular structures represent major sources of "surprises"
  - The anatomy of the area is unstable

- Dissection must be meticulous, thyroid surgery is a major source of risk

- Anatomical findings can not predict the answer to mechanical forces

- Lesions caused by mechanical forces are different

- Macroscopical integrity can not exclude palsy