The role of the Superior laryngeal nerve in laryngeal motor (re)innervation.

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Content:
1. Laryngeal motor innervation in humans (peripheral)
2. A new animal model to investigate functional innervation
3. Conclusions and Discussion

Peripheral neuroanatomy (humans)

"human communicating nerve"
"cricothyroid connection branch"

[Sanudo et al. 1999]
Peripheral neuroanatomy (humans)

[Wu et. al., Arch Otol 1994]

Animal model for functional neuroanatomy

[Maranillo et. al. 2003]

Evoked potentials – a way to explore motor projections:

Compound muscle action potential:
- amplitude (mV)
- latency time (ms)
Simultaneous recording in:
- Thyroarytenoid right
- Thyroarytenoid left
- Lateral Cricoarytenoid right
- Lateral Cricoarytenoid left
- Posterior cricoarytenoid right
- Posterior cricoarytenoid left
- Cricothyroid right
- Cricothyroid left
Animal model for functional neuroanatomy

Simultaneous recording in:
- TA right
- TA left
- LCA right
- LCA left
- PCA right
- PCA left
- CT right
- CT left

Results

Superior laryngeal nerve stimulation (external branch):

Ratio SLN/RLN neuromuscular function

Animal number

TA
LCA
PCA
CT

- = Superior laryngeal nerve
  - = Recurrent laryngeal nerve
"Each laryngeal muscle has a double nerve supply from the superior and from the inferior laryngeal nerves."

Exner, 1884

I suggest that the laryngeal nerves are really a plexus of nerves. Just as the vagus breaks up into its various plexuses in the body, it does the same in the larynx. It is a highly modified plexus.

Dilworth, 1921

What is the physiology behind this dual innervation pattern?

What motor tasks are conducted by the Superior laryngeal nerve?
Conclusions / Discussion

After a RLN injury, it can be hypothesized that intact SLN fibers (whatever normal functions they have) could reinnervate the laryngeal muscles.

Conclusions

- The intrinsic laryngeal muscles are functionally innervated by both the Superior- and the Recurrent laryngeal nerves.
- Motor innervation is exclusively ipsilateral.
- There is a "Plexus laryngealis".
- Collateral reinnervation by the Superior laryngeal nerve may be a negative factor for functional outcome after laryngeal denervation injuries.
- Treatment strategies should aim at supporting regenerating Recurrent laryngeal nerve fibers, and prevent collateral reinnervation by Superior laryngeal nerve fibers.

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