



Experiments on excised larynx: interest and limits

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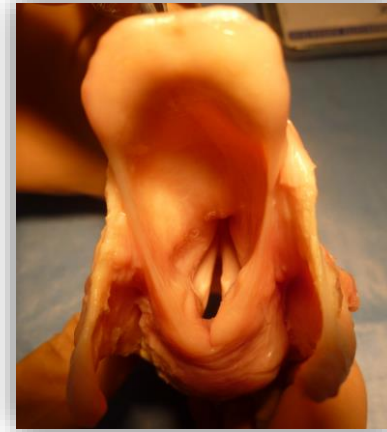
Experiments on excised human larynges

In vivo



Very realistic
Very complex
Multi-parametric adjustment
Limit to invasiveness

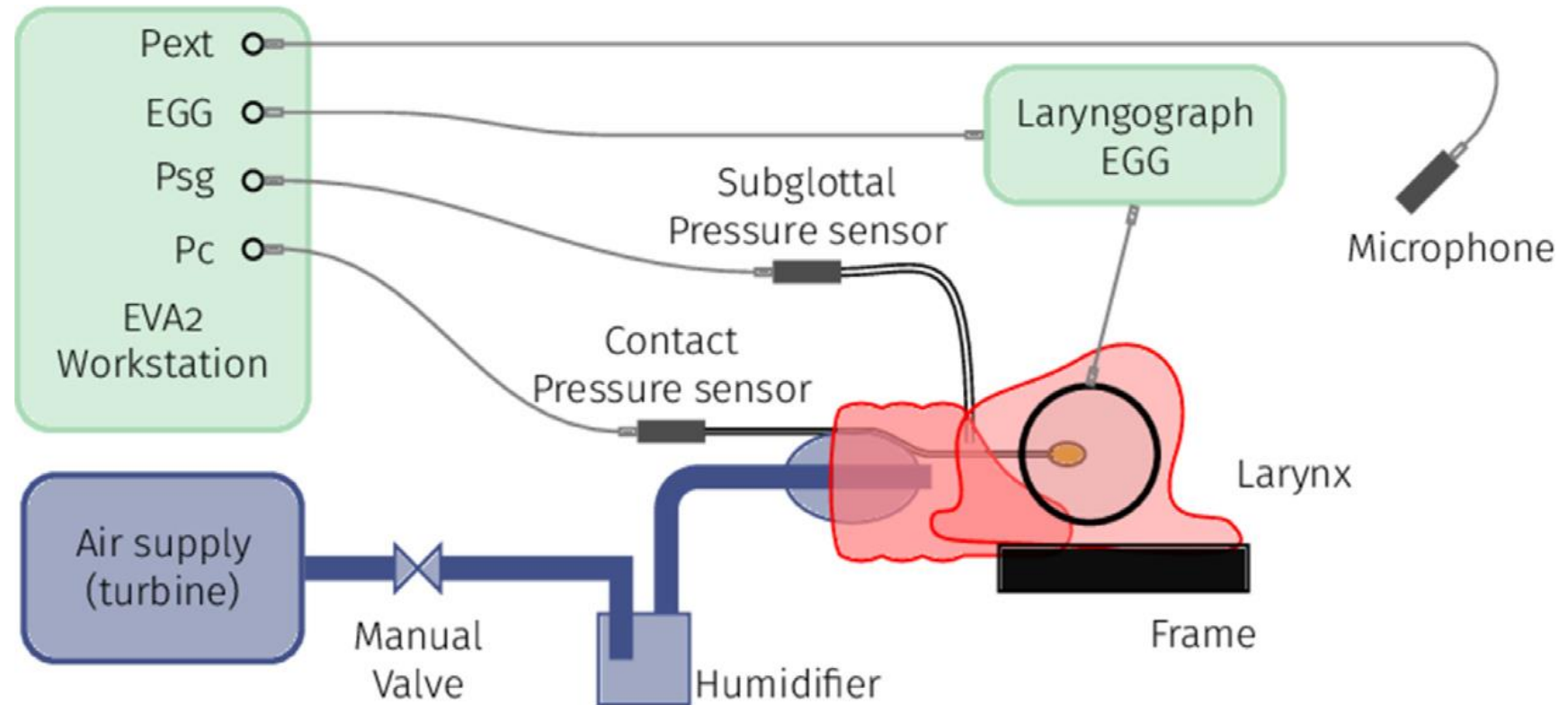
Ex vivo



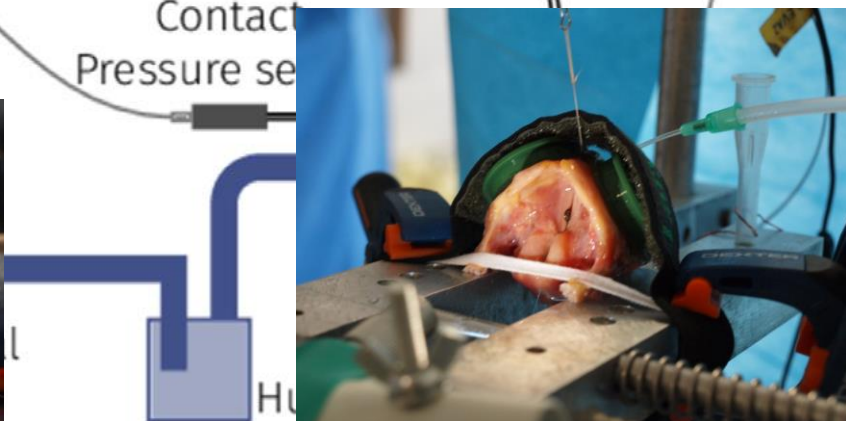
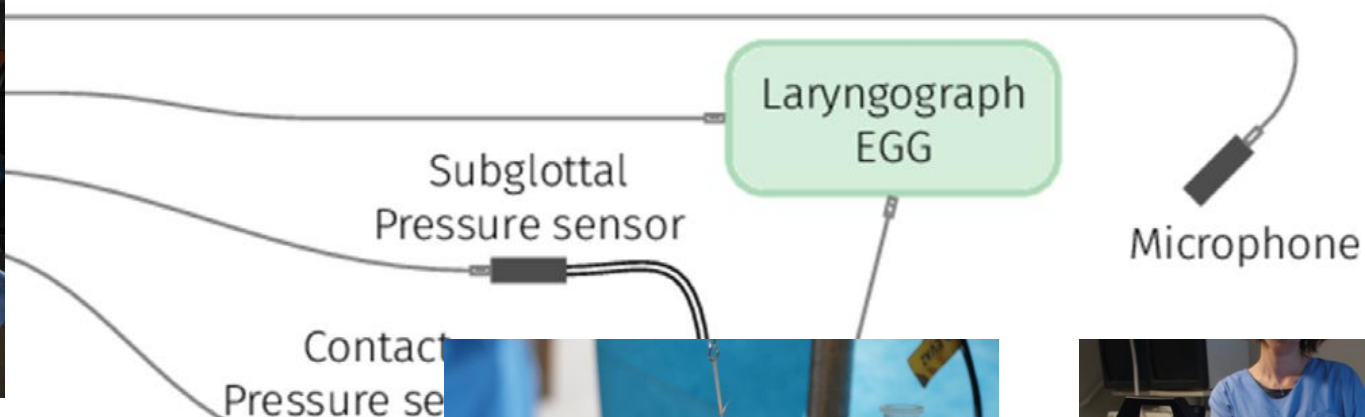
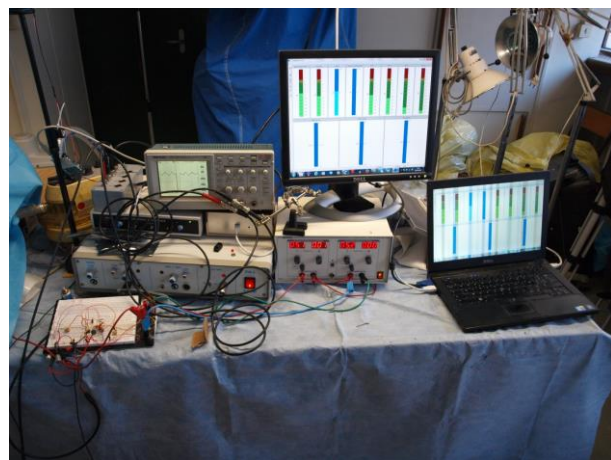
Realistic
Very complex
Mono-parametric adjustment
Multiparametric low level adjustment
No limit to invasiveness

In silico
Numerical

Experimental testbench for excised larynges



Etude *ex vivo* et banc expérimental



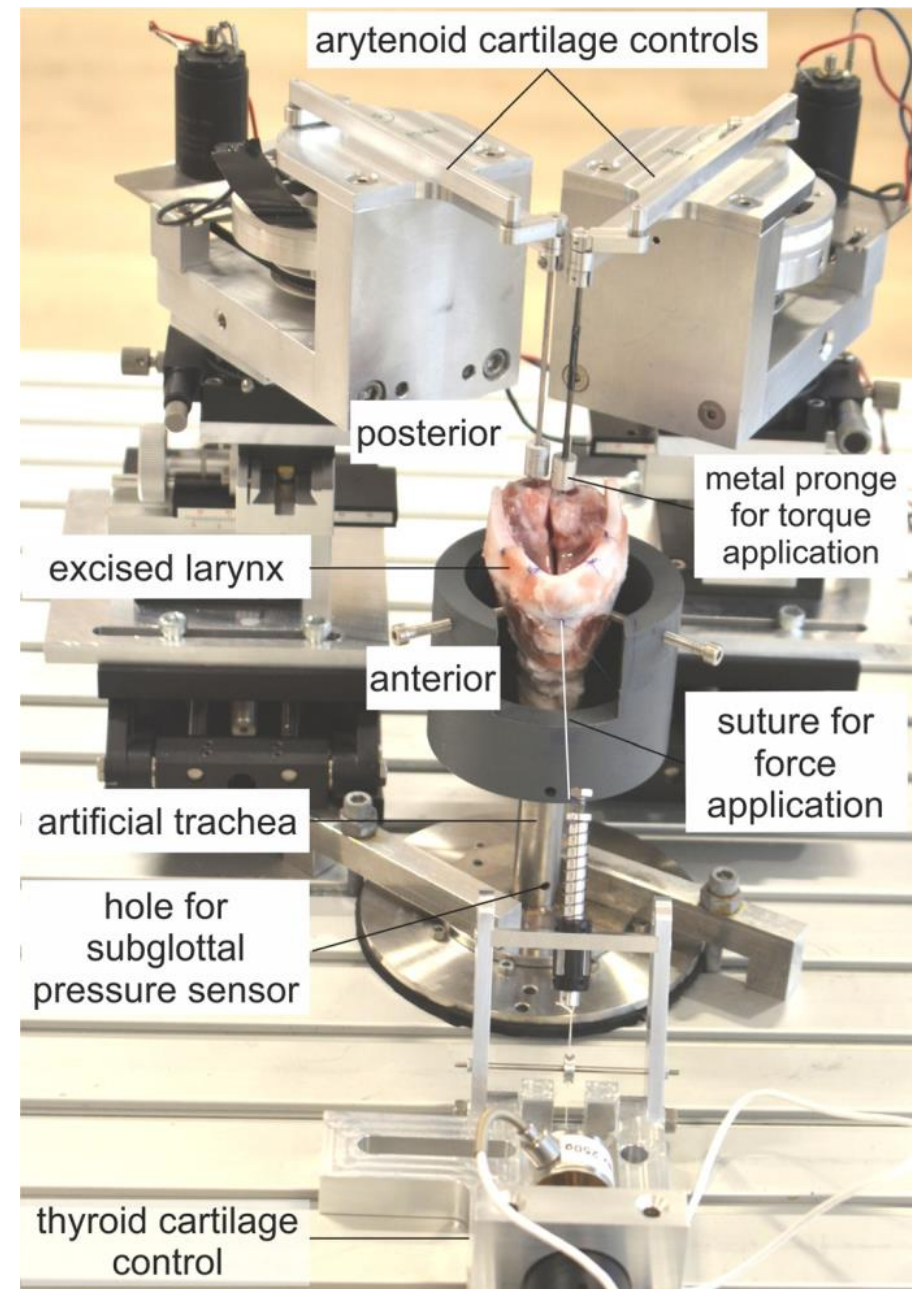
Refining the control of the (pre)-phonatory position

Van den Berg, « The vibrating larynx », 1956

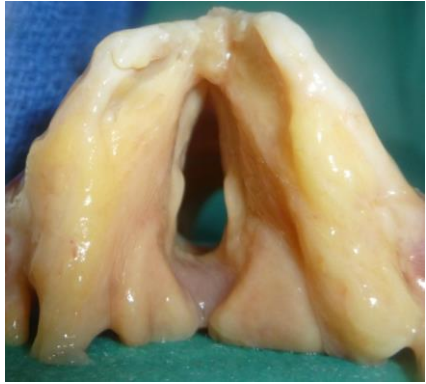


Refining the control of the (pre)-phonatory position

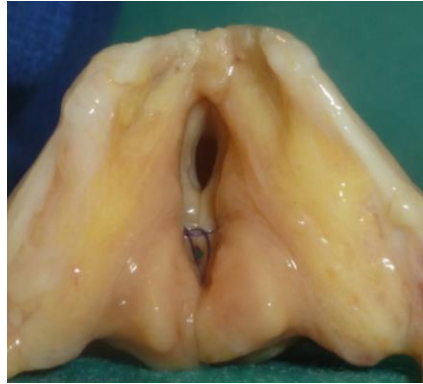
- Depending on the experimental question
- Often on animal larynges
- Often only rough controls of the glottal configurations



Pre-phonatory position?



NA

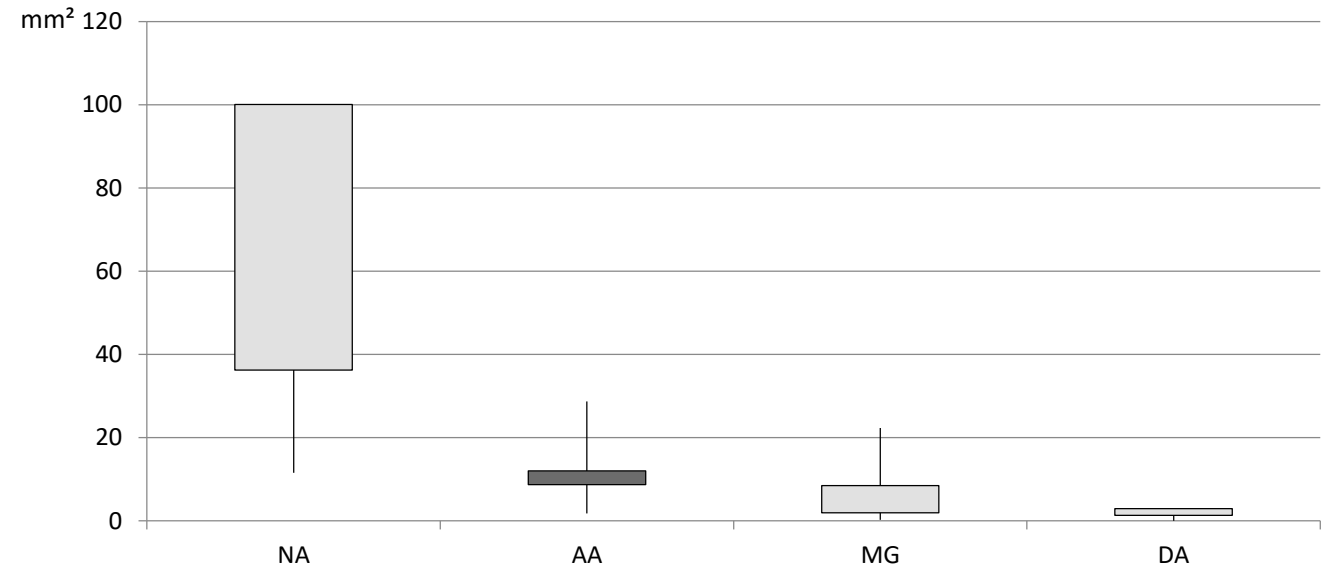


AA



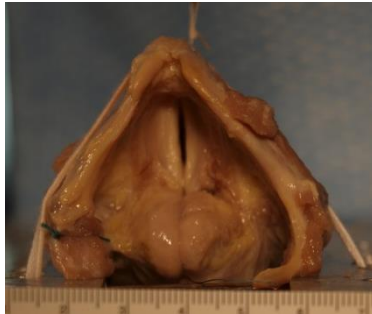
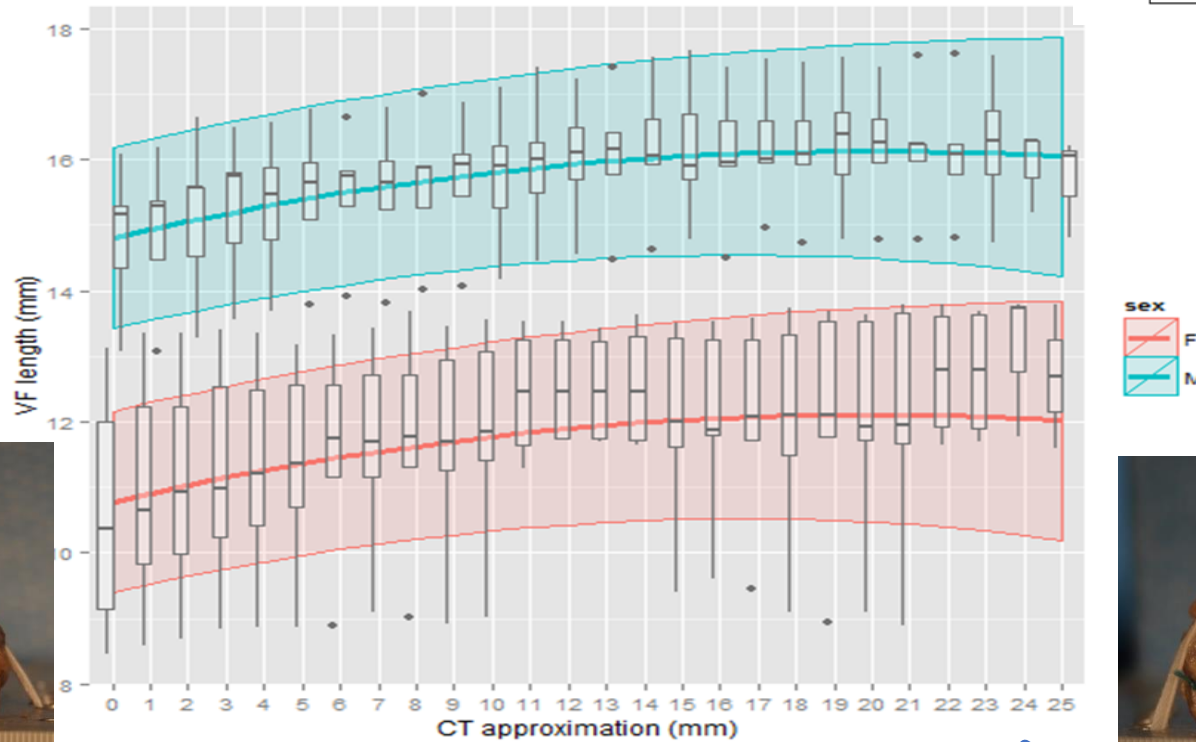
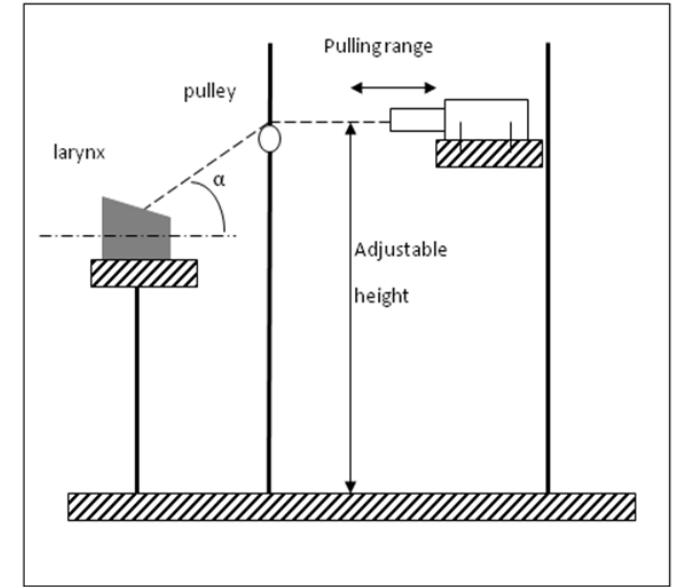
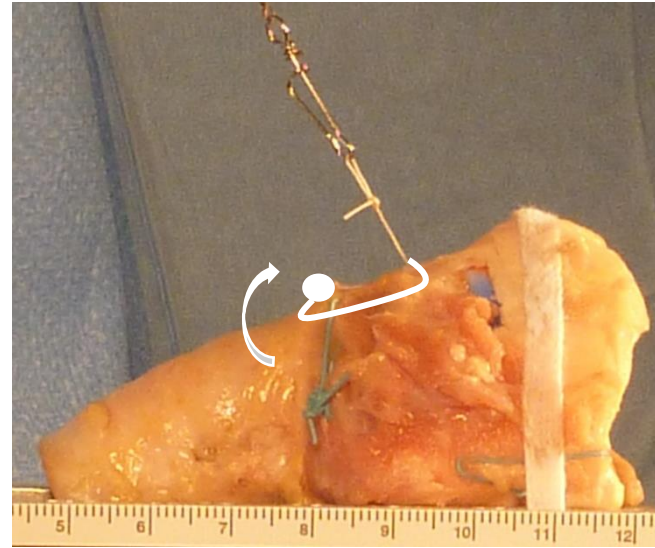
MG

- Glottic area and adduction method

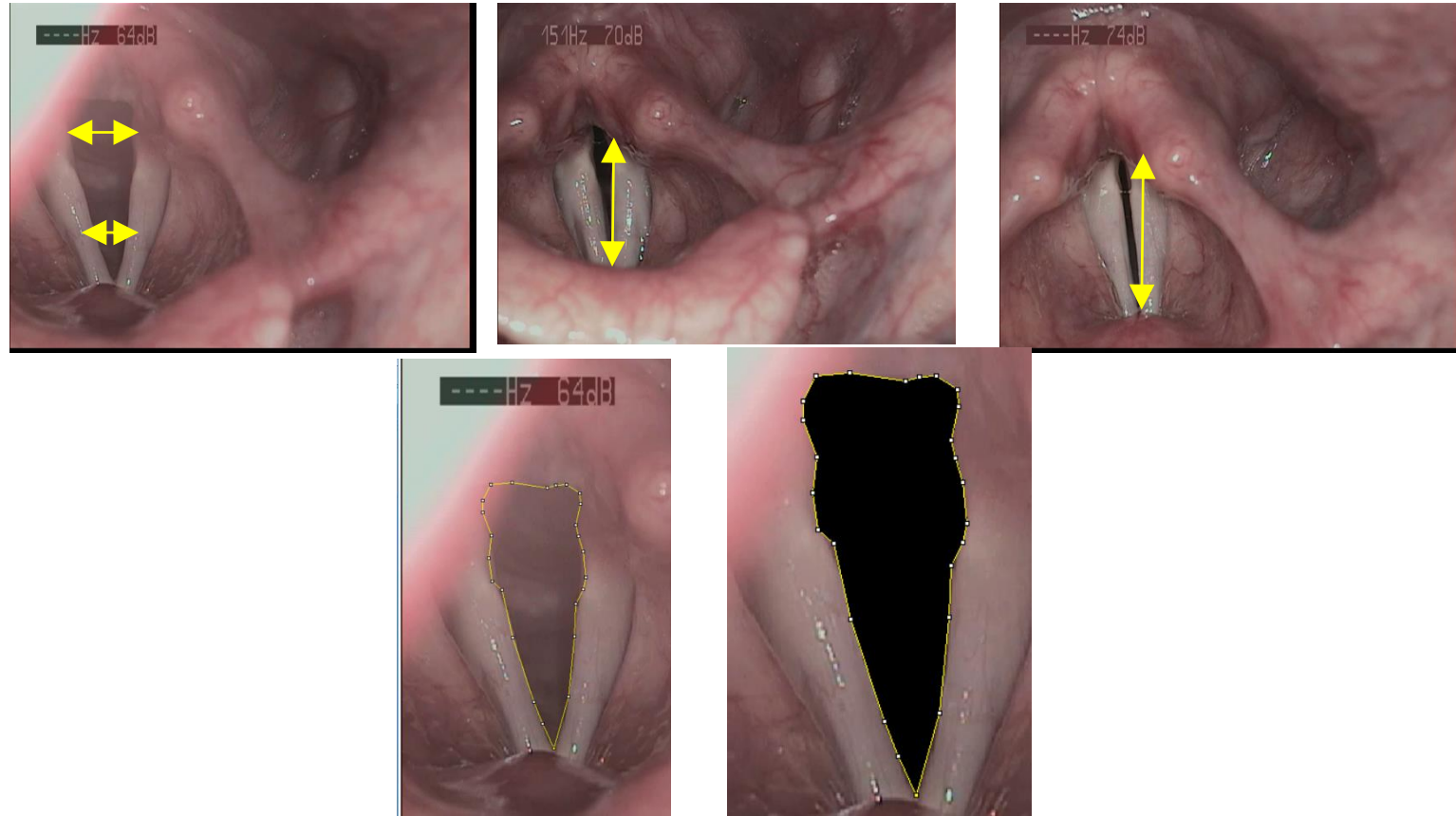


Pre-phonatory position?

- VF Lengthening

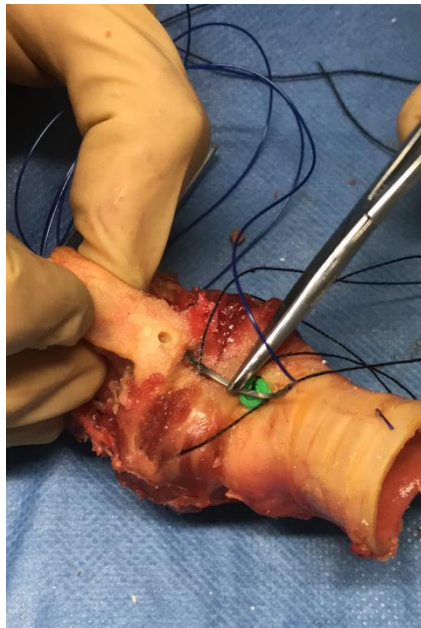


Pre-phonatory position

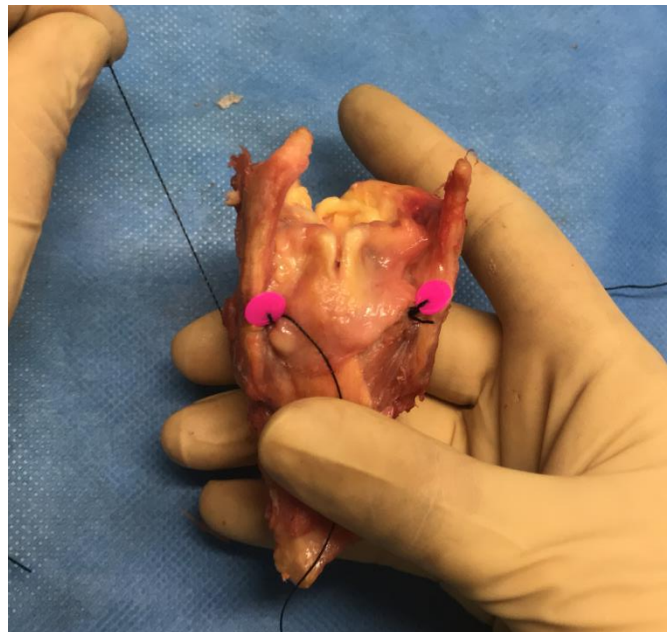


Crico-thyroid (CT), Lateral (LCA) and Posterior crico-arytenoid (PCA) Muscles

- The insertions of the different muscles were reproduced
- The actions of these muscles were reproduced by the approximation of their insertions.



CT

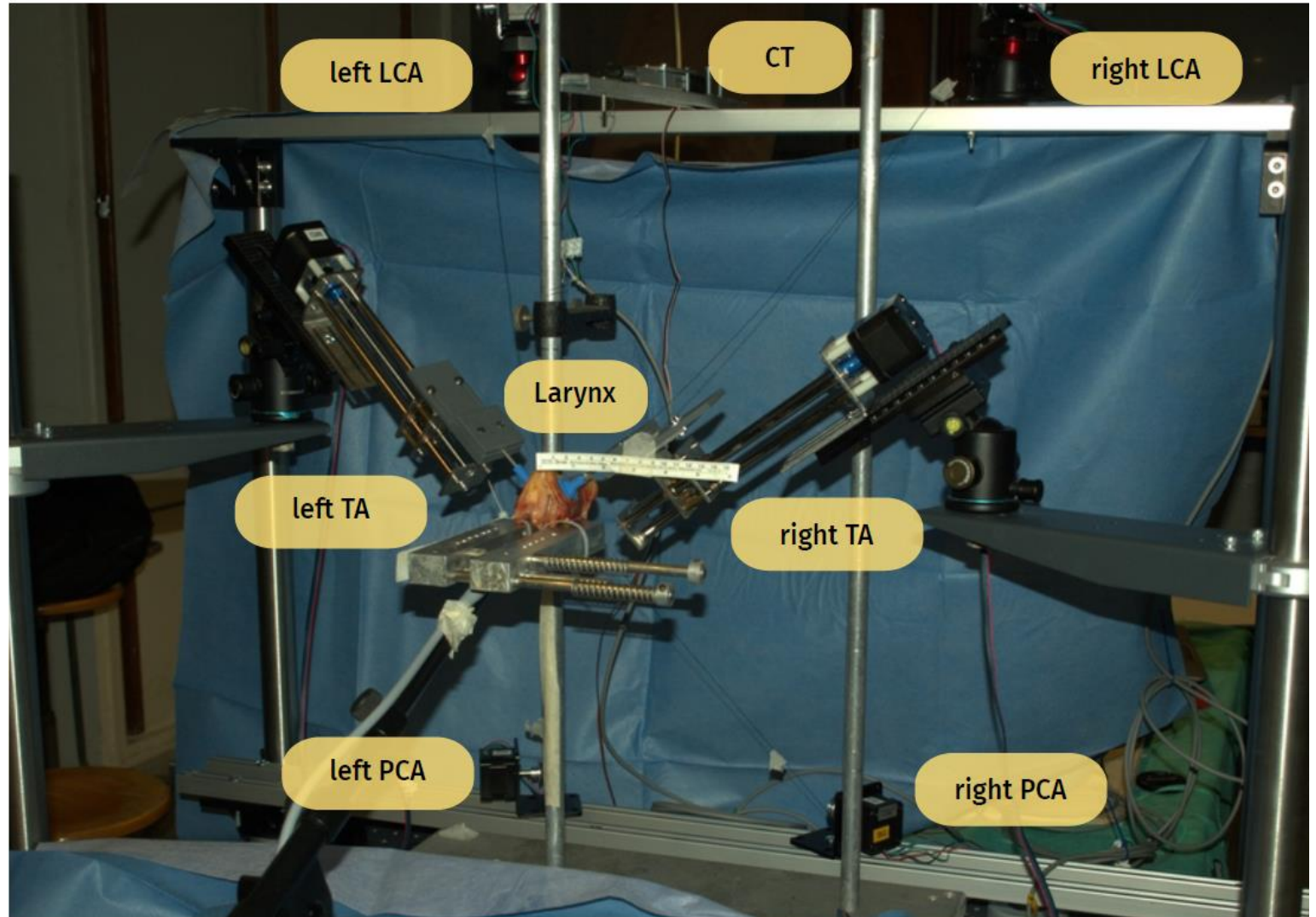
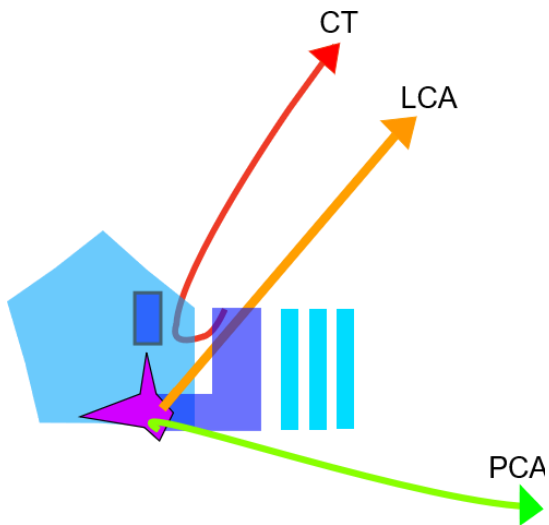
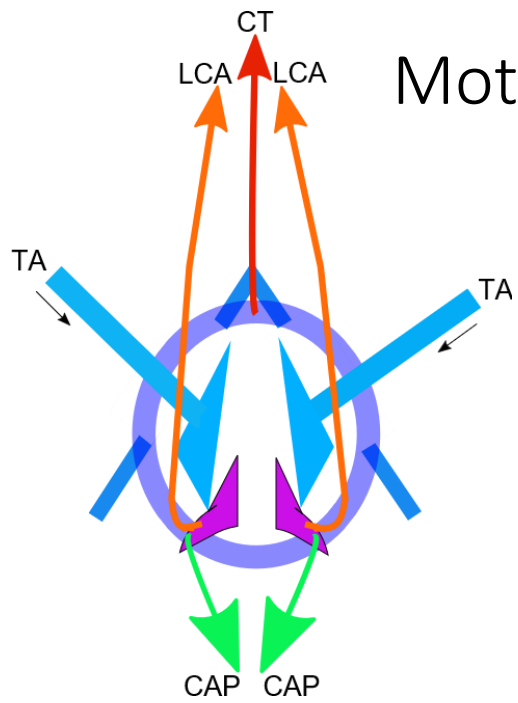


LCA

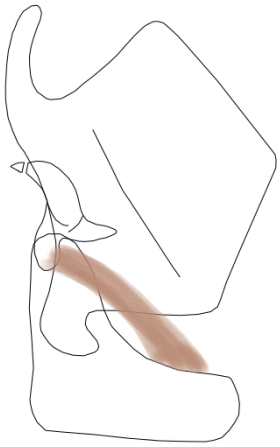


vPCA

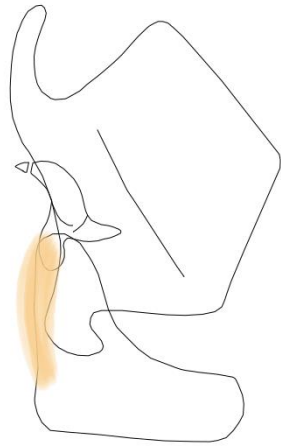
Motorization of the different actions



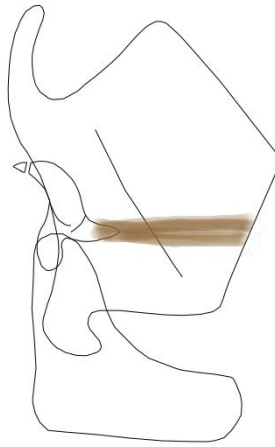
LCA



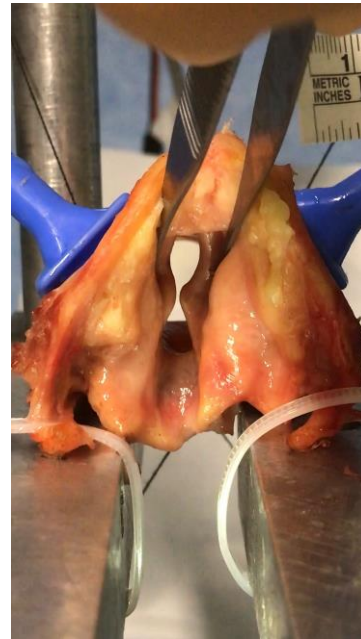
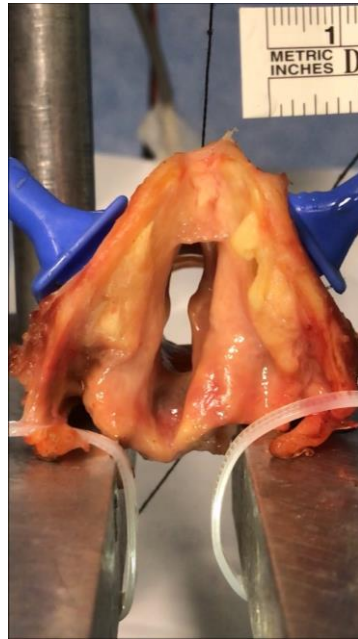
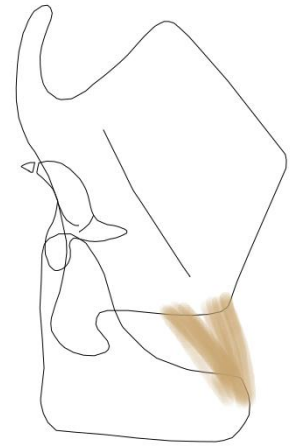
PCA



TA

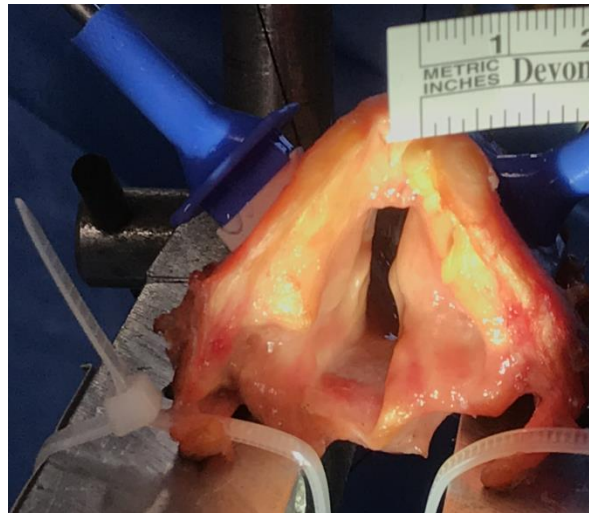
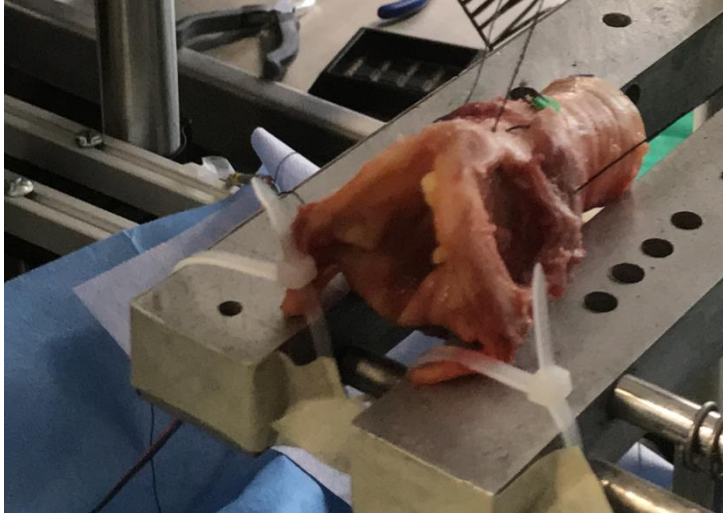


CT



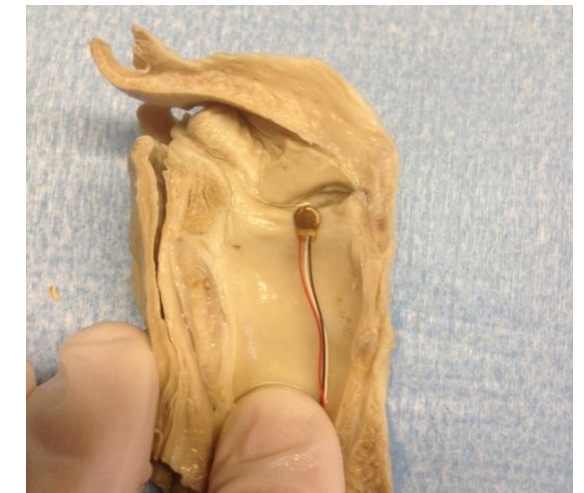
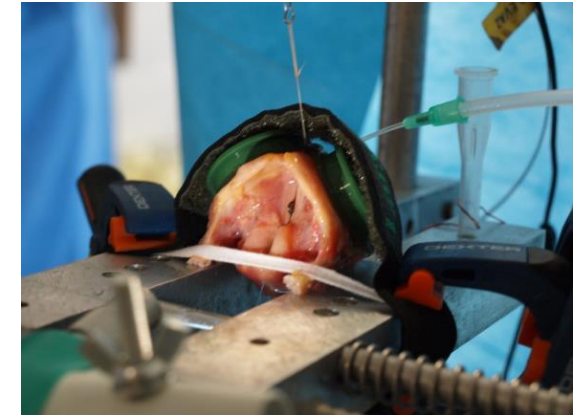
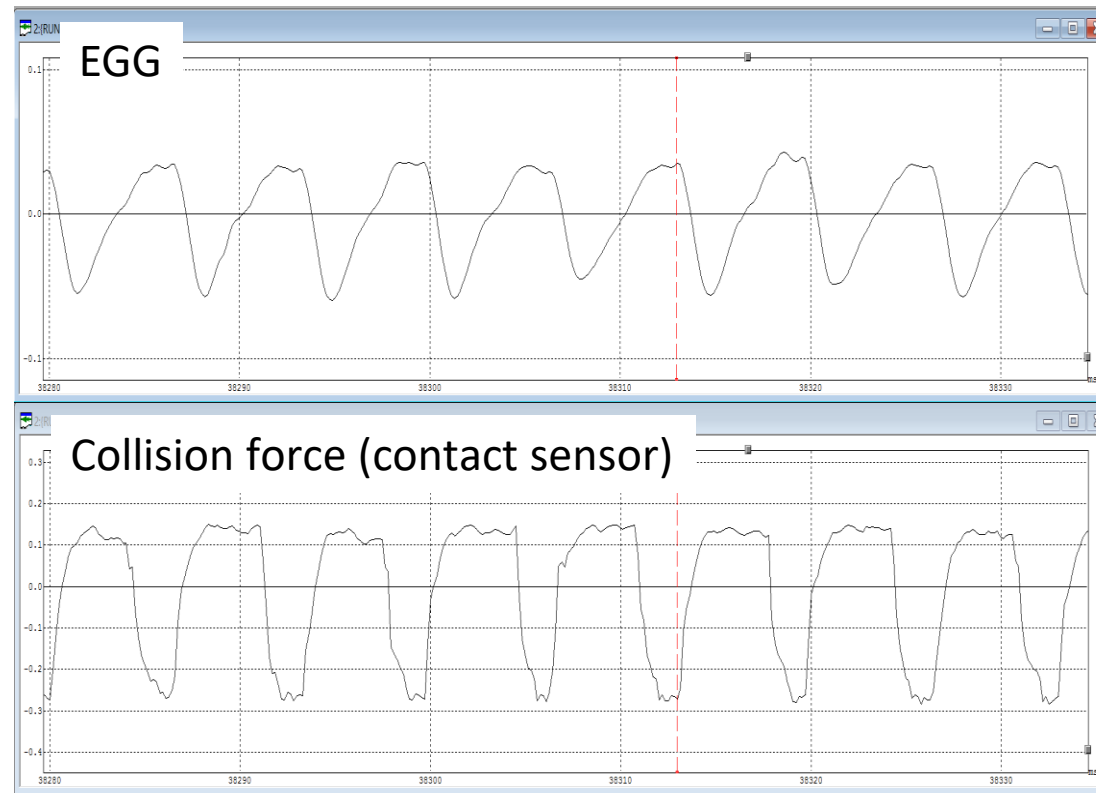
Action of the vocalis?

- Reduced to its function of adduction of the membranous part of the vocal fold
- Not its role of control of vocal fold physical properties

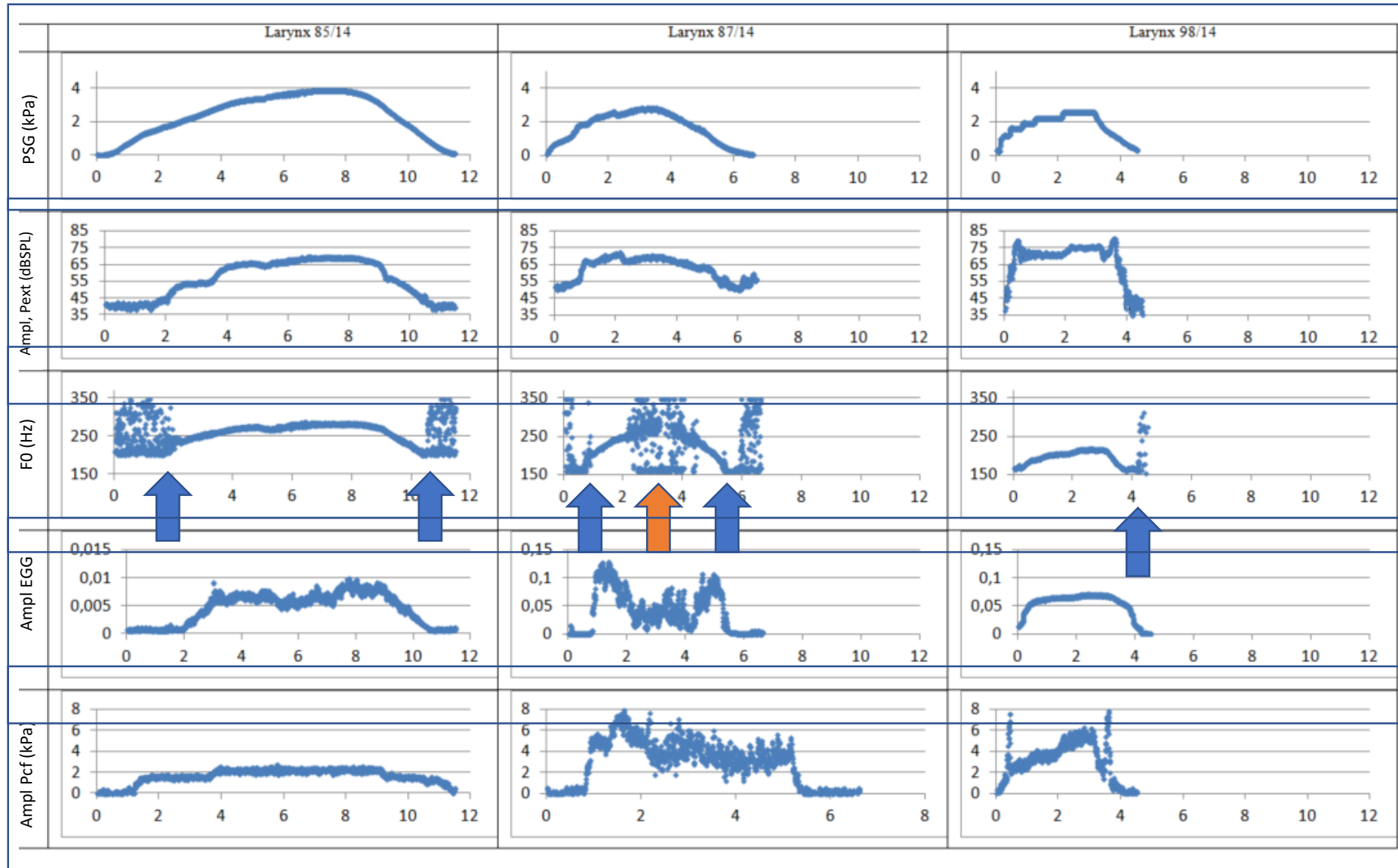


Invasive set-up to explore precise questions

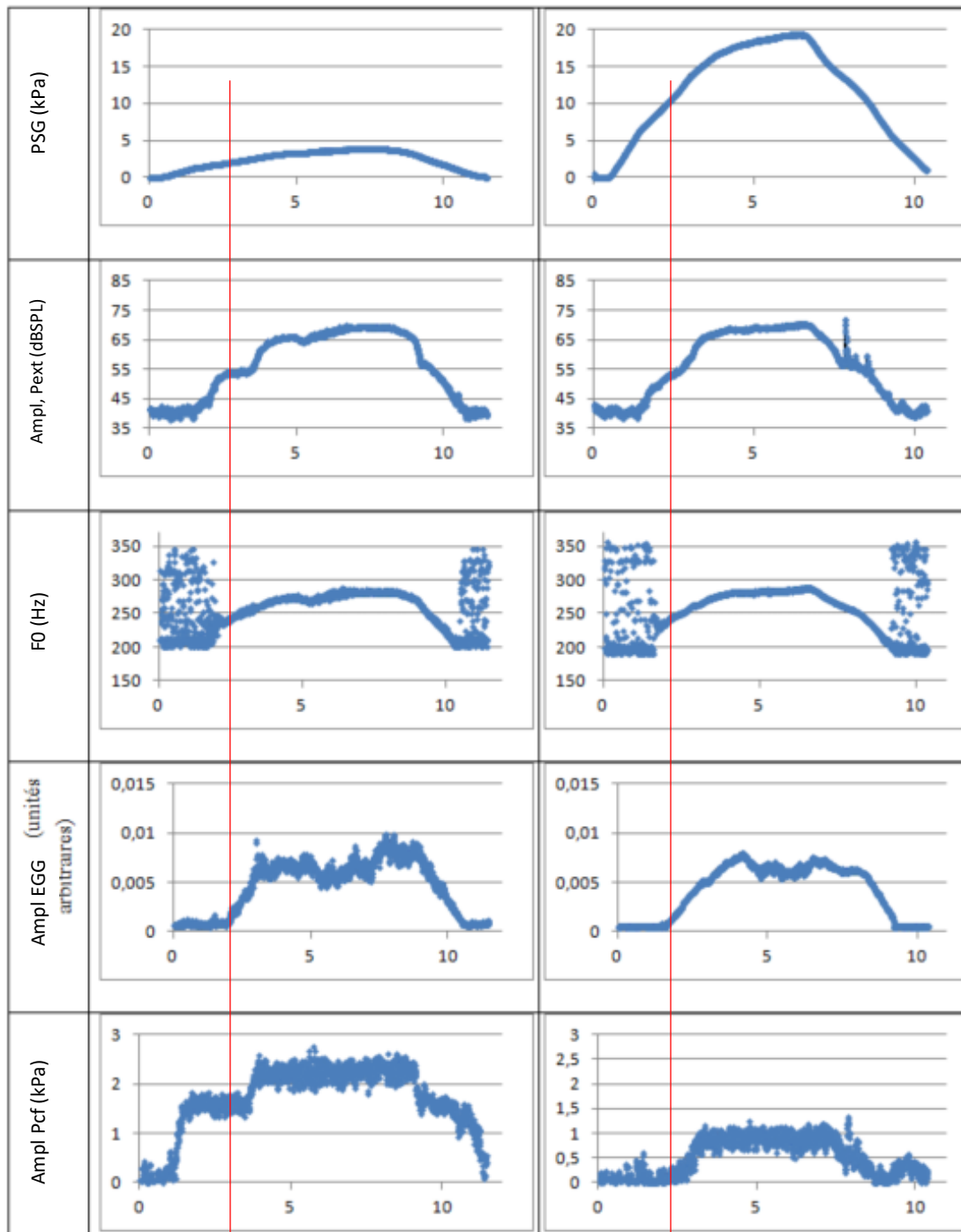
Measurement of the collision between the VF



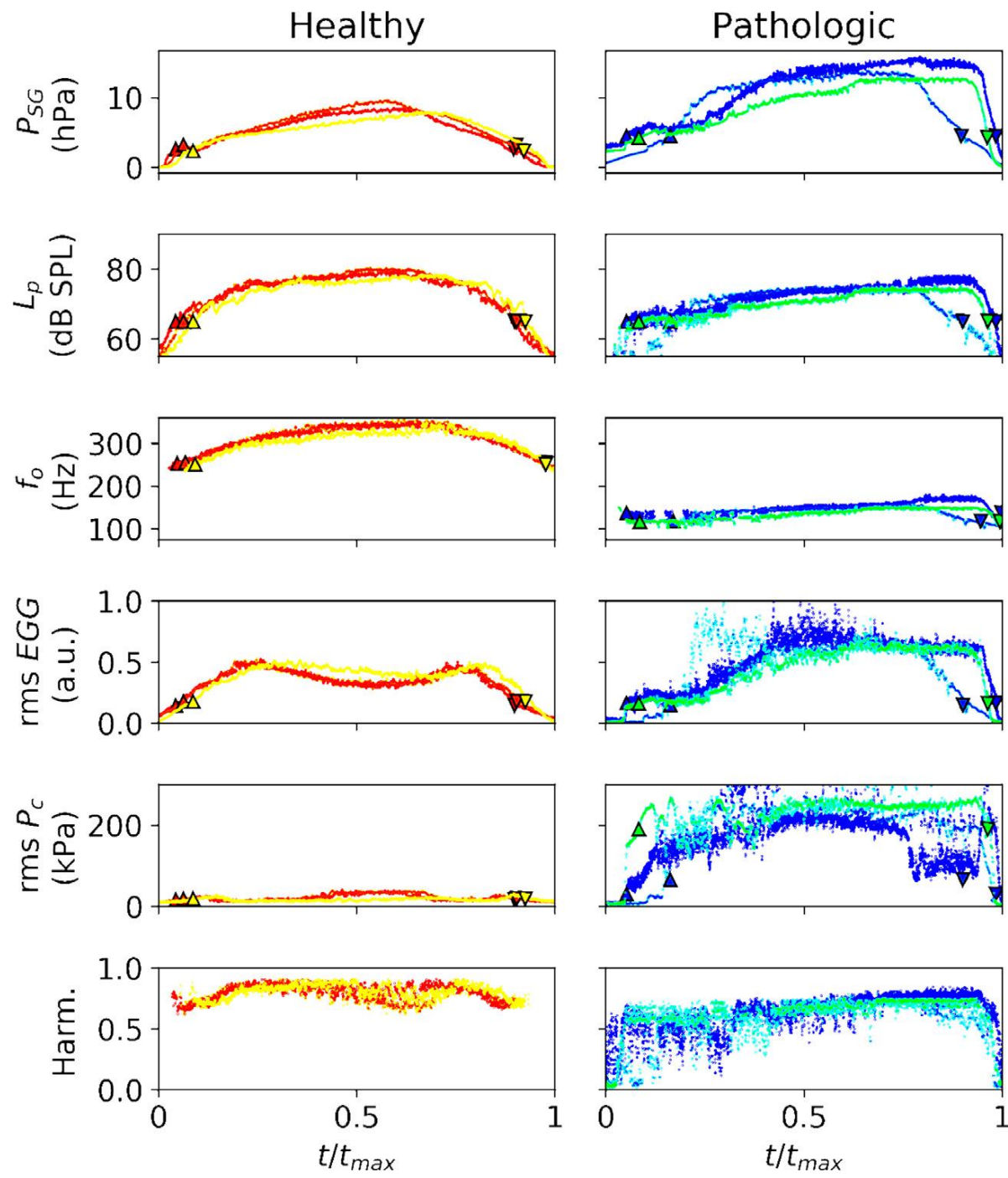
Measurement of the collision between the VF



Varying P_{SG} dynamics



Pathological larynx (Reinke edema)



Conclusion

- High level of realism
 - Anatomy and geometry are natural
 - Complexity of the set-up
- Need for choices
 - Depending on the experimental question
 - Complexity is not always interesting
- Allows isolated manipulations of parameters
 - Better understanding of strategies
 - But still a passive model
 - No real-time adaptation for now

To be continued....

