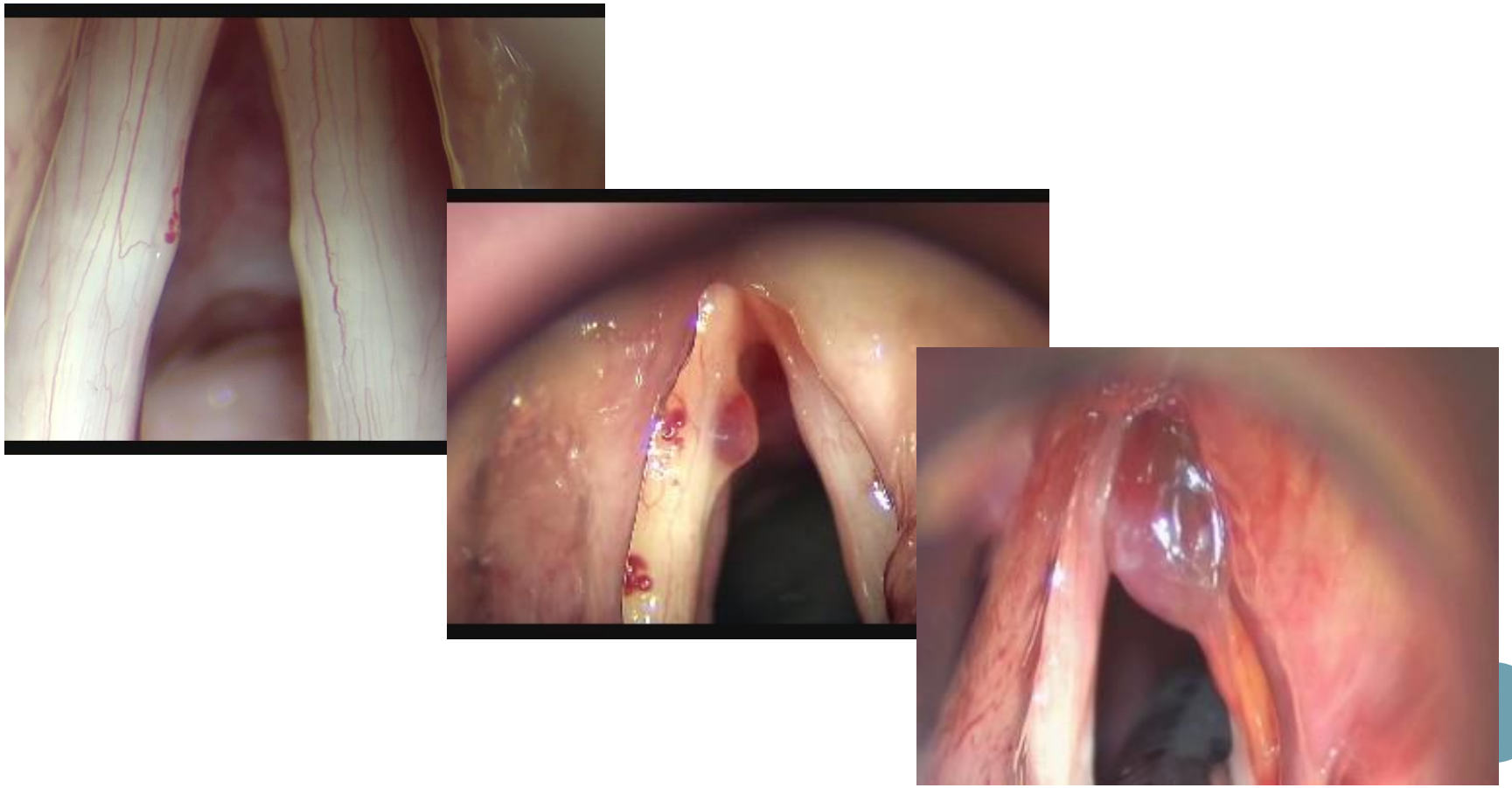
Phonotraumatism: High subglottal pressure and collision force

Aude Lagier

Symposium J. Sundberg

Vocal abuse → Phonotraumatism? → Lesions



PHONOTRAUMATISM?

Mechanical stress in Phonation, Titze IR, J of Voice, 1994: 8 (2); 99-105

Microtraumatism due to mechanical stress applied to the vocal folds during the phonation

Components:

- Tensile Stress (antero-posterior tension)
- Maximum active contractile Stress
-Inertial Stress
-Aerodynamic Stress : mean intra-glottic pressure
- Arytenoid Contact Stress
-Shear stress
-Collision stress between vocal folds

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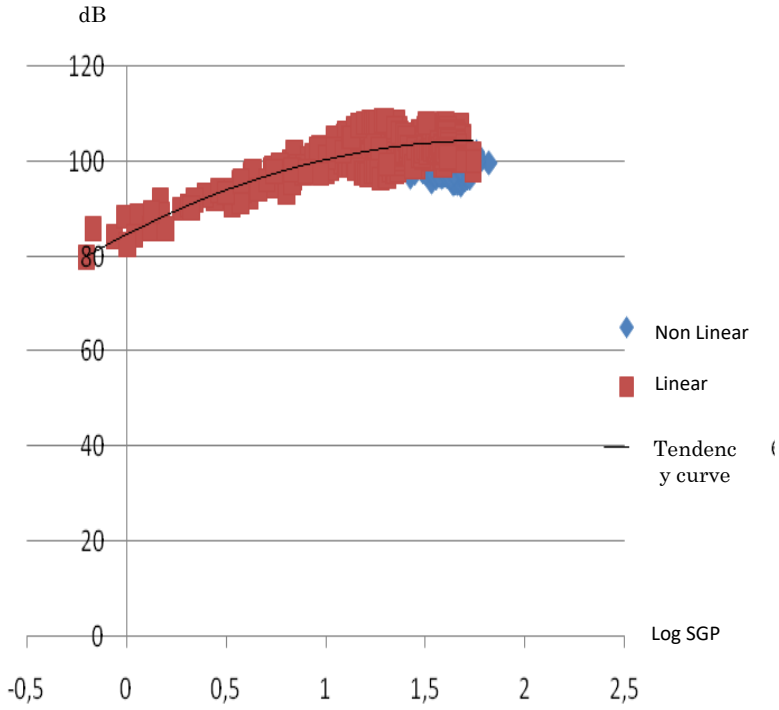
-**Collision stress between vocal folds**

Shouted voice and real subglottal pressure

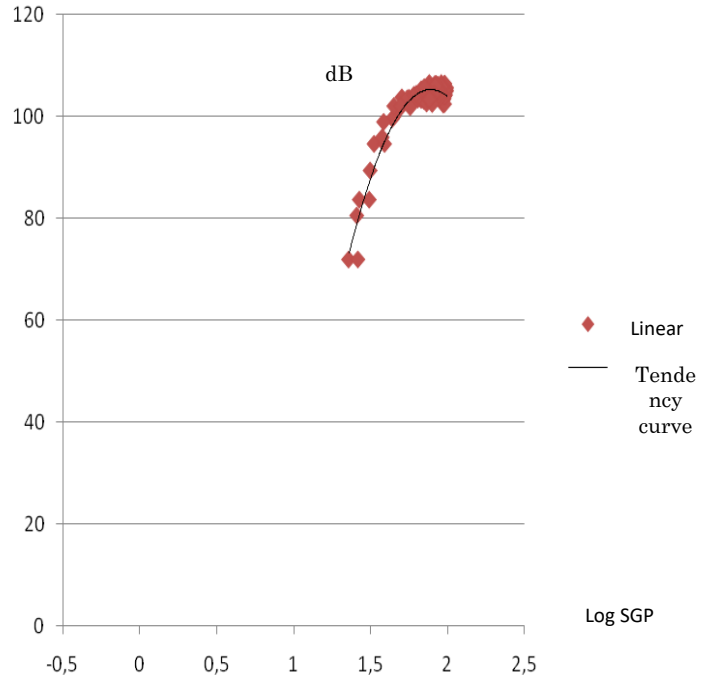
- 3 healthy men
- “shout as loud as you can”

- Records (EVA2® workstation):
  - Electroglottography (EGG)
  - Real Subglottique Pressure (tracheal puncture)
  - Voice SPL (micro at 90 cm from mouth)

Shouted voice and real subglottal pressure

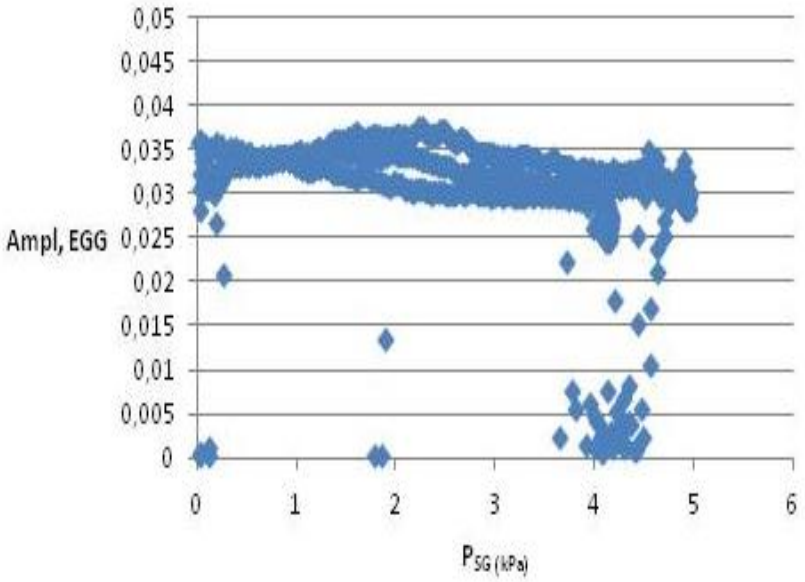


Subjet 1

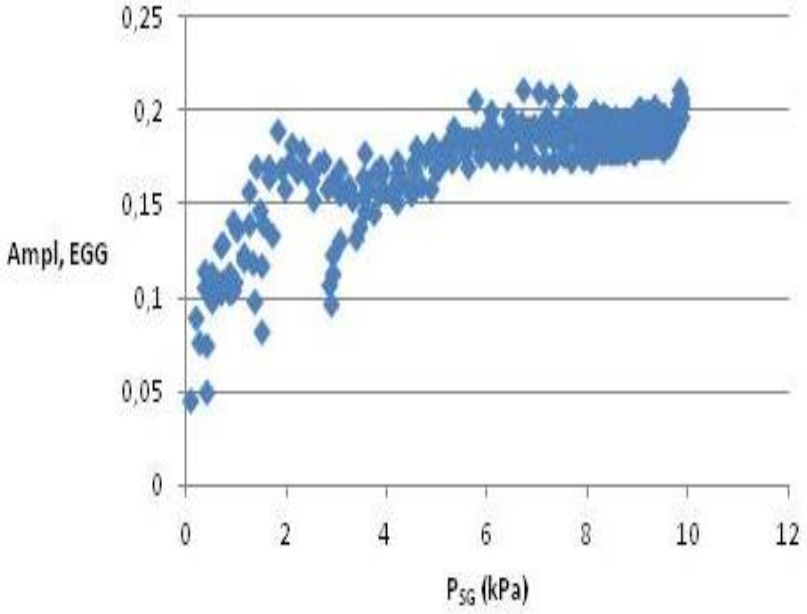


Subjet 3

Shouted voice and real subglottal pressure

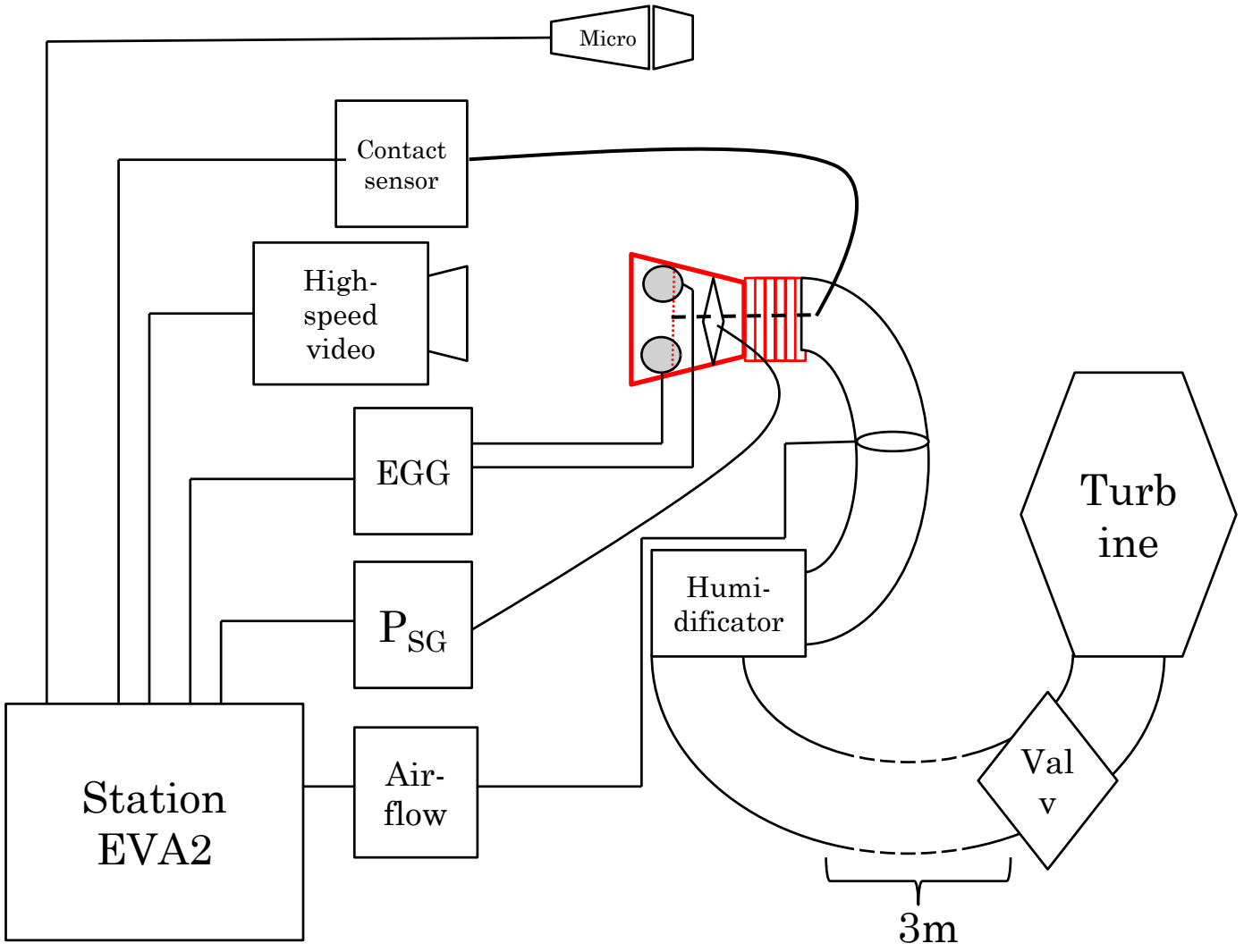


Subject 1

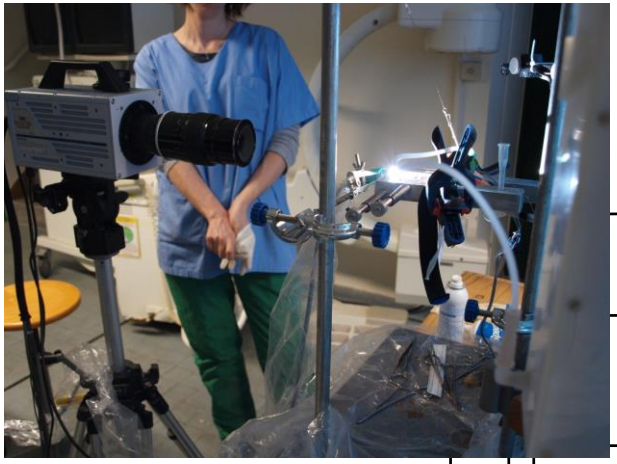


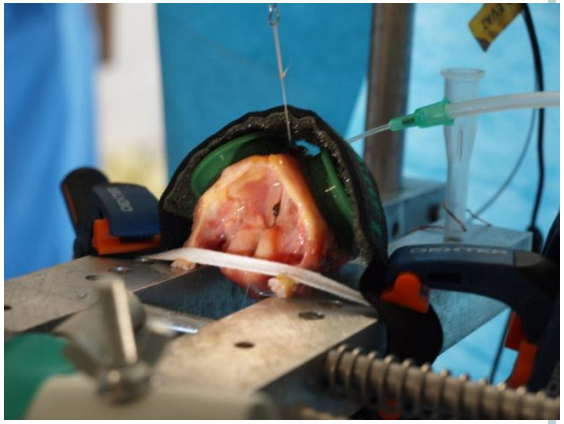
Subject 3

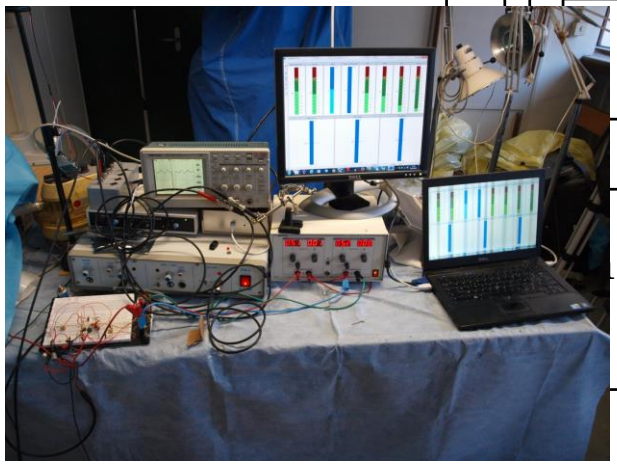
Excised larynges experiments

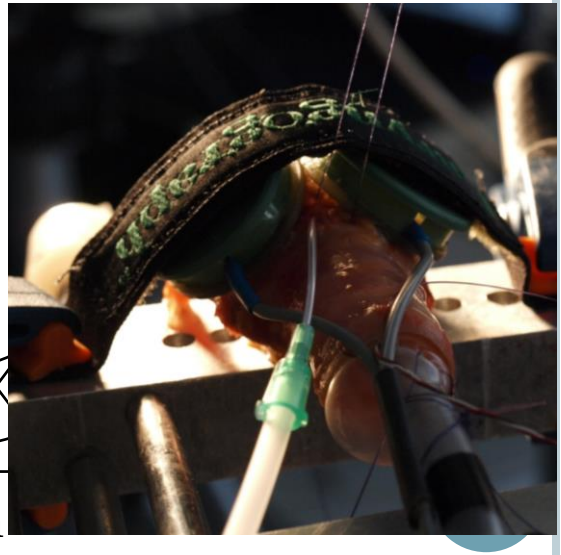


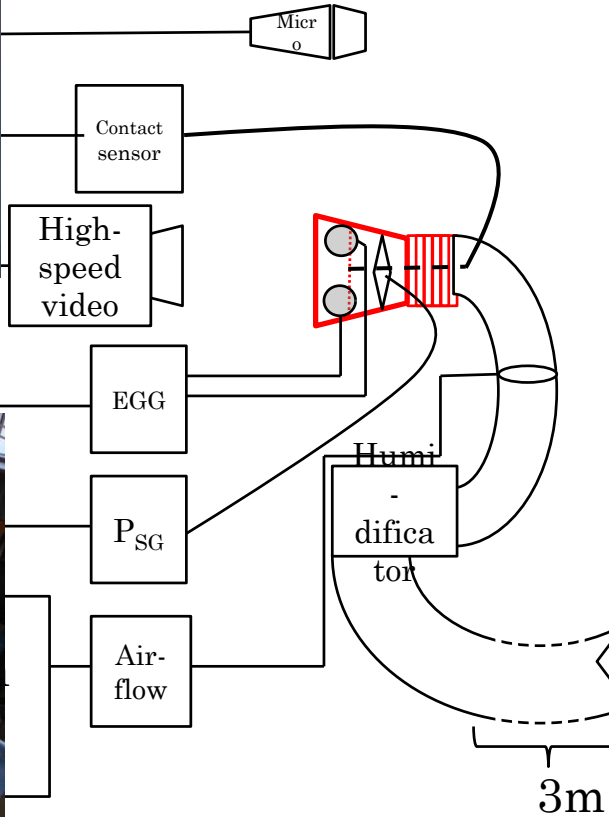
Excised larynges experiments











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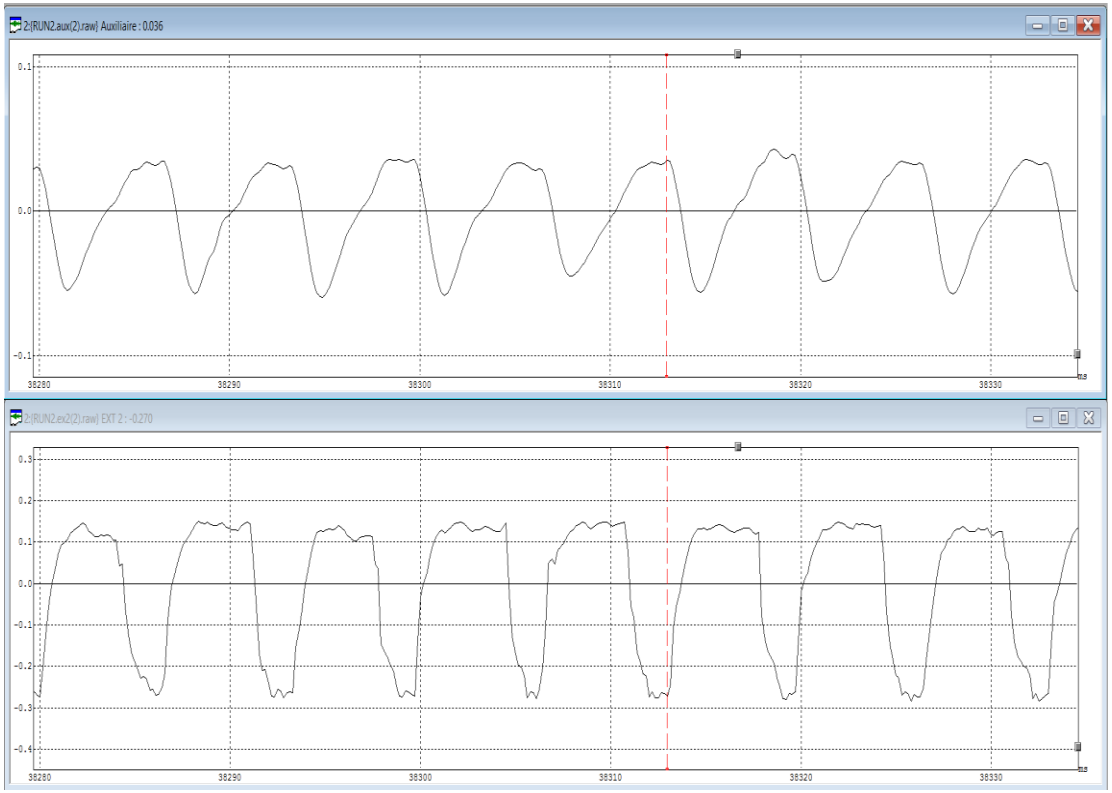

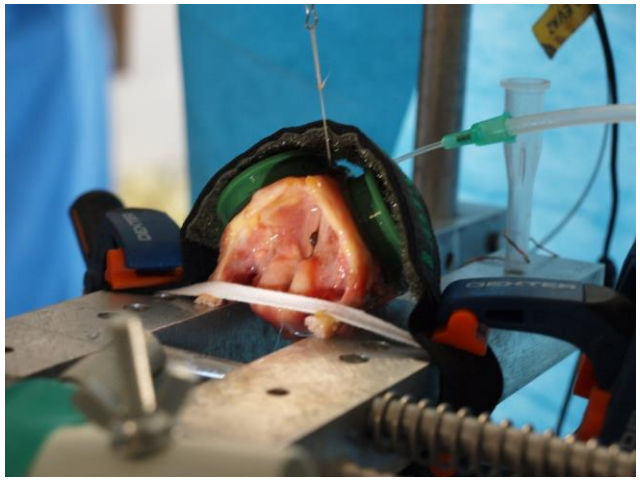

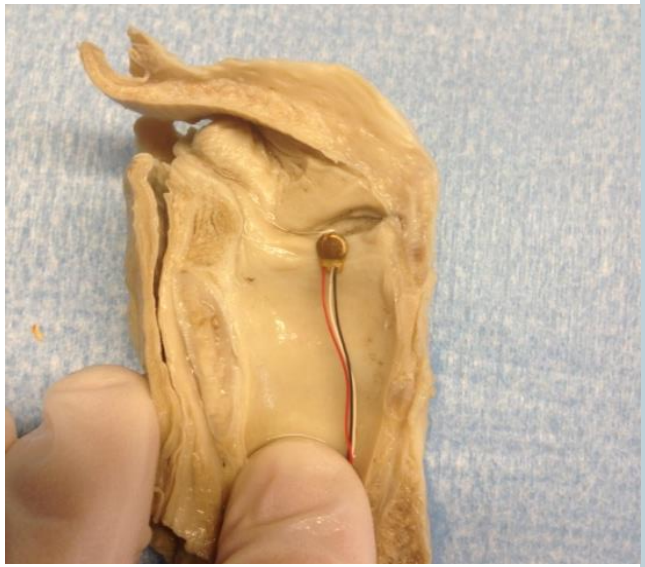

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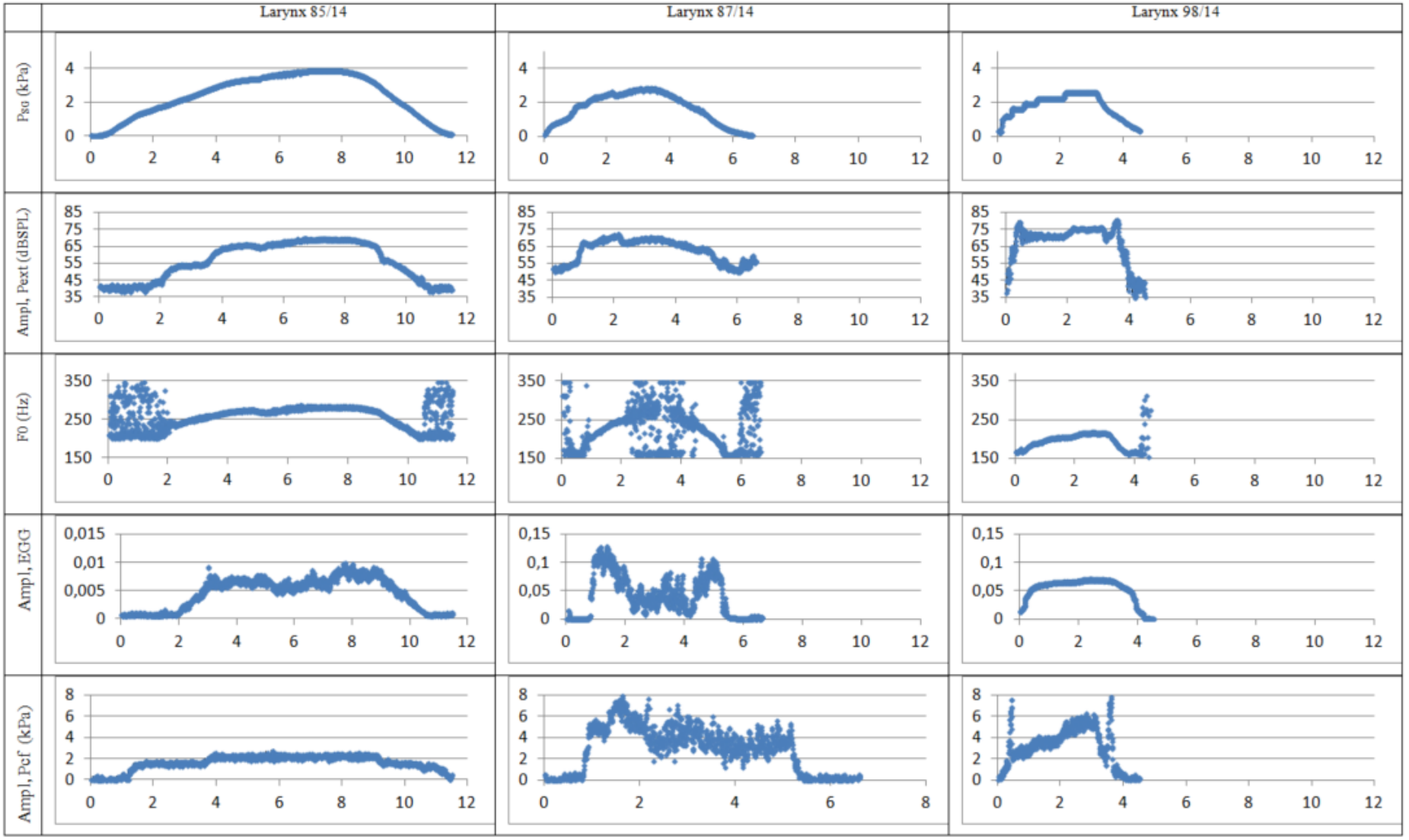
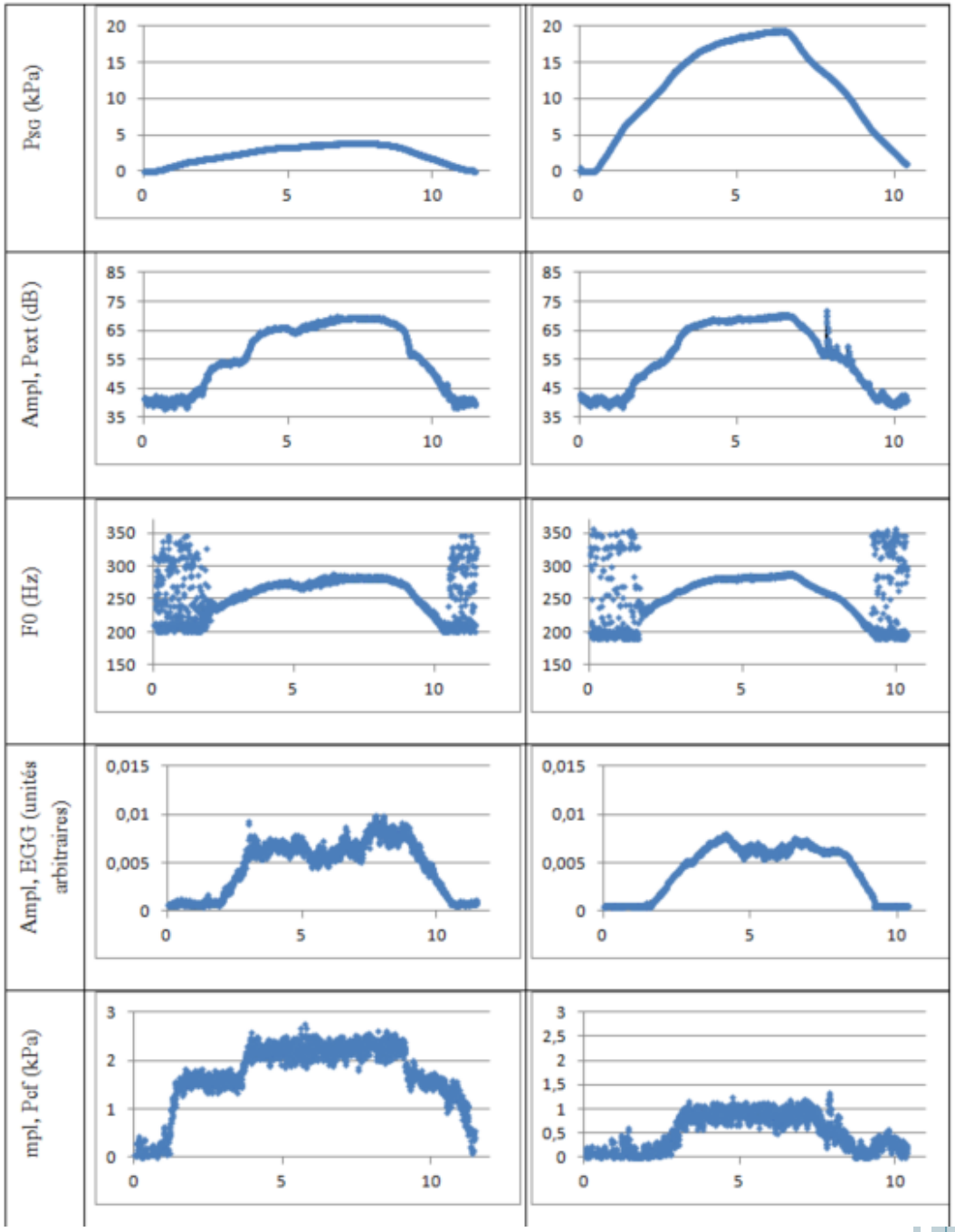


VERY HIGH SUBGLOTTAL PRESSURES

- Comparison of 2 ramps of P_{SG}:
  - 0-4kPa
  - 0-20 kPa

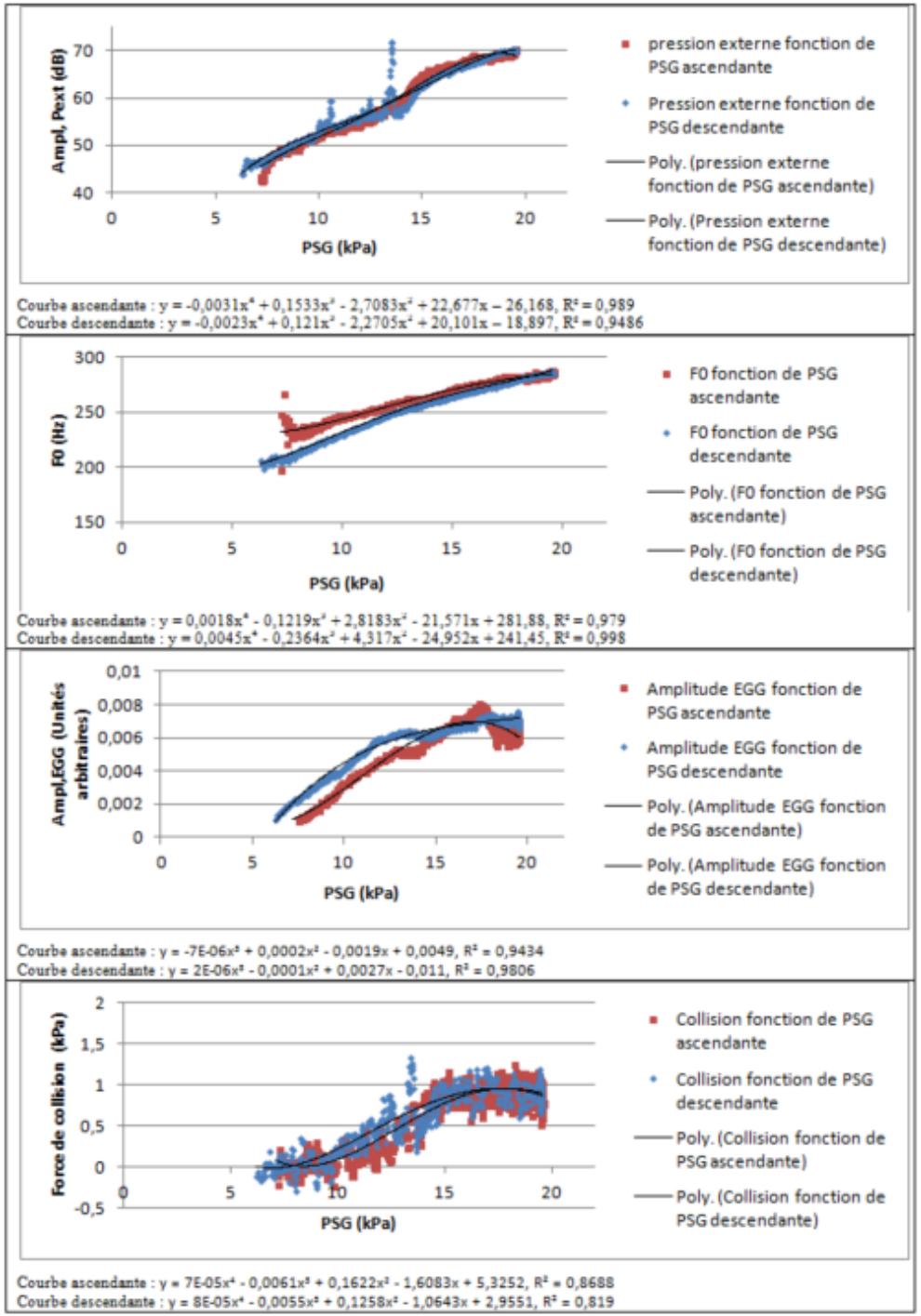
- Very similar behavior….



EXCISED LARYNGES EXPERIMENTS

PSG ramp of 0-20 kPa

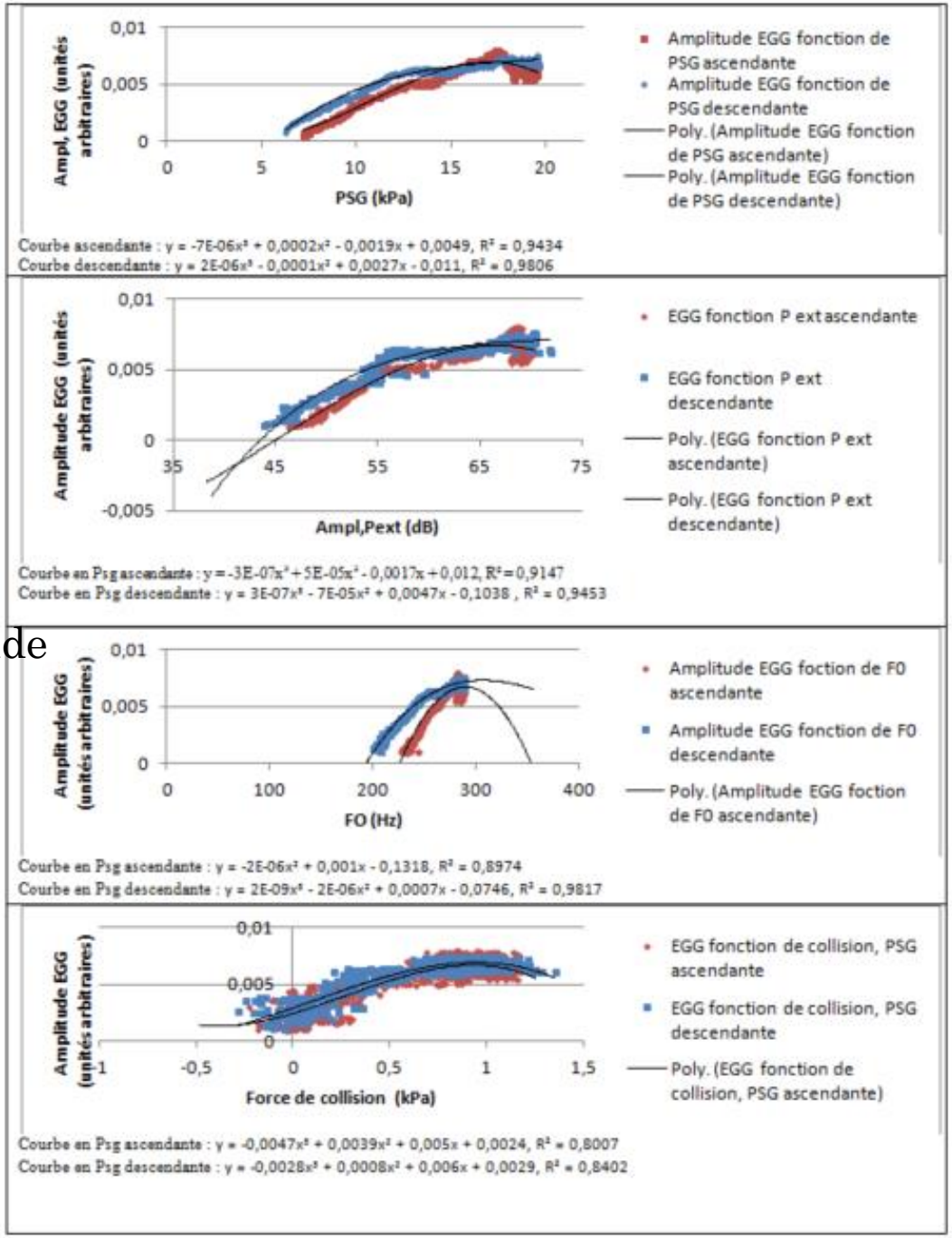
Correlations with the P_{SG}



EXCISED LARYNGES EXPERIMENTS

PSG ramp of 0-20 kPa

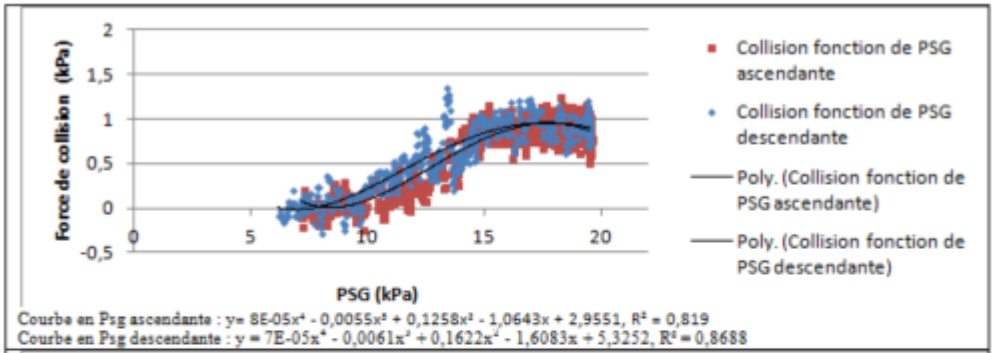
Correlations with the EGG amplitude



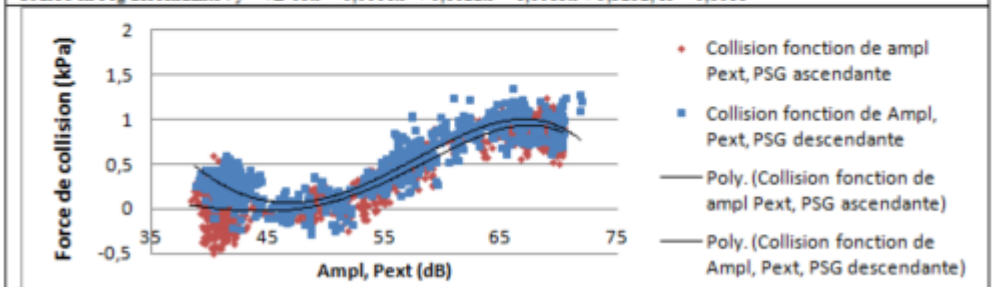
EXCISED LARYNGES EXPERIMENTS

PSG ramp of 0-20 kPa

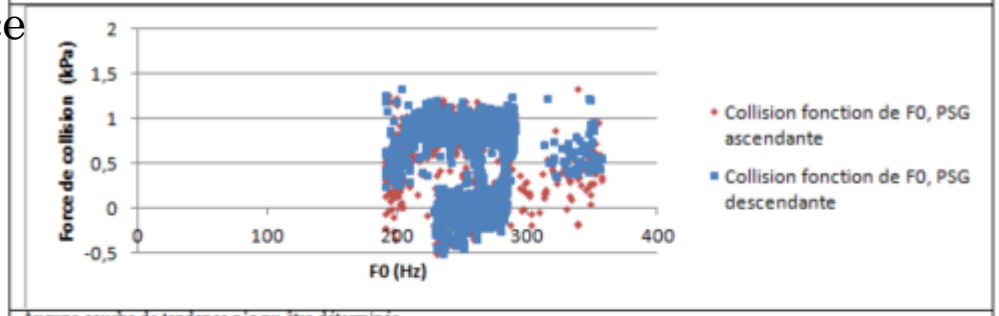
Correlations with the Collision force



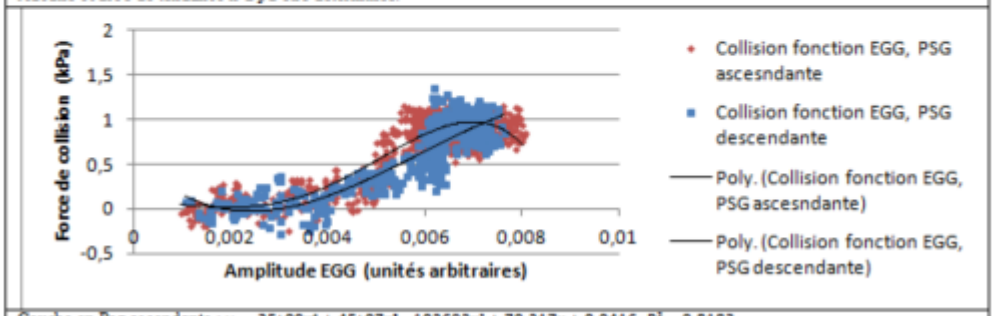
Courbe en Psg ascendante : y= 8E-05x⁴ - 0,0055x³ + 0,1258x² - 1,0643x + 2,9551, R² = 0,819
Courbe en Psg descendante : y = 7E-05x⁴ - 0,0061x³ + 0,1622x² - 1,6083x + 5,3252, R² = 0,8688



Courbe en Psg ascendante : y = -6E-06x⁴ + 0,0011x³ - 0,0783x² + 2,3733x - 26,159, R² = 0,8881
Courbe en Psg descendante : y = -3E-06x⁴ + 0,0004x³ - 0,0175x² - 0,0488x + 9,6652, R² = 0,8286



Aucune courbe de tendance n'a pu être déterminée.



Courbe en Psg ascendante : y = -3E+09x⁴ + 4E+07x³ - 102692x² + 70,217x + 0,0416, R² = 0,8183
Courbe en Psg descendante : y = -8E+06x³ + 137676x² - 530,6x + 0,5591, R² = 0,7802

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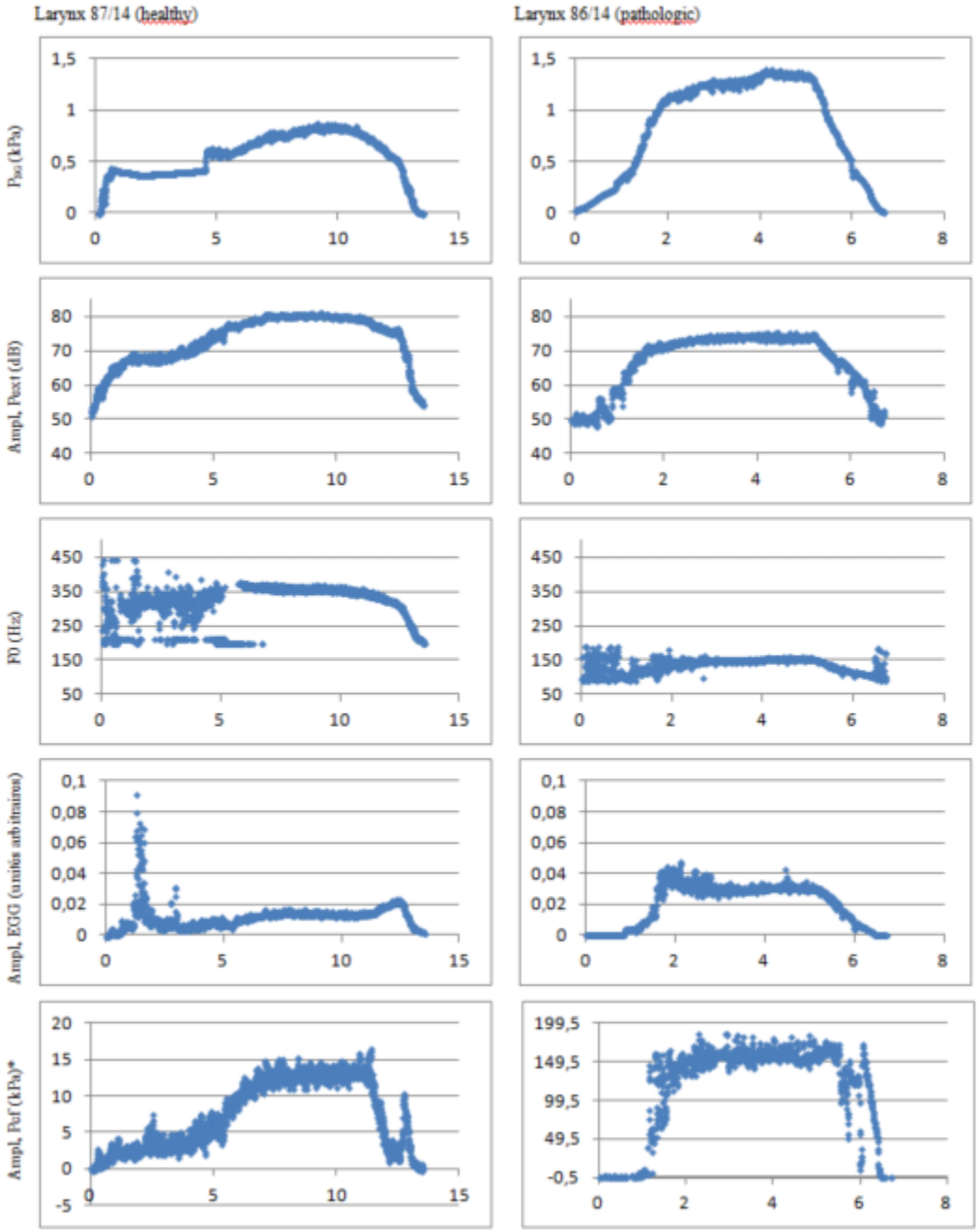

Conclusions

- Upper limits of laryngeal physiology
  - In vivo
  - Ex vivo
- Phonotraumatism and vocal fold collision?
- Vocal fold collision and laryngeal pathology