

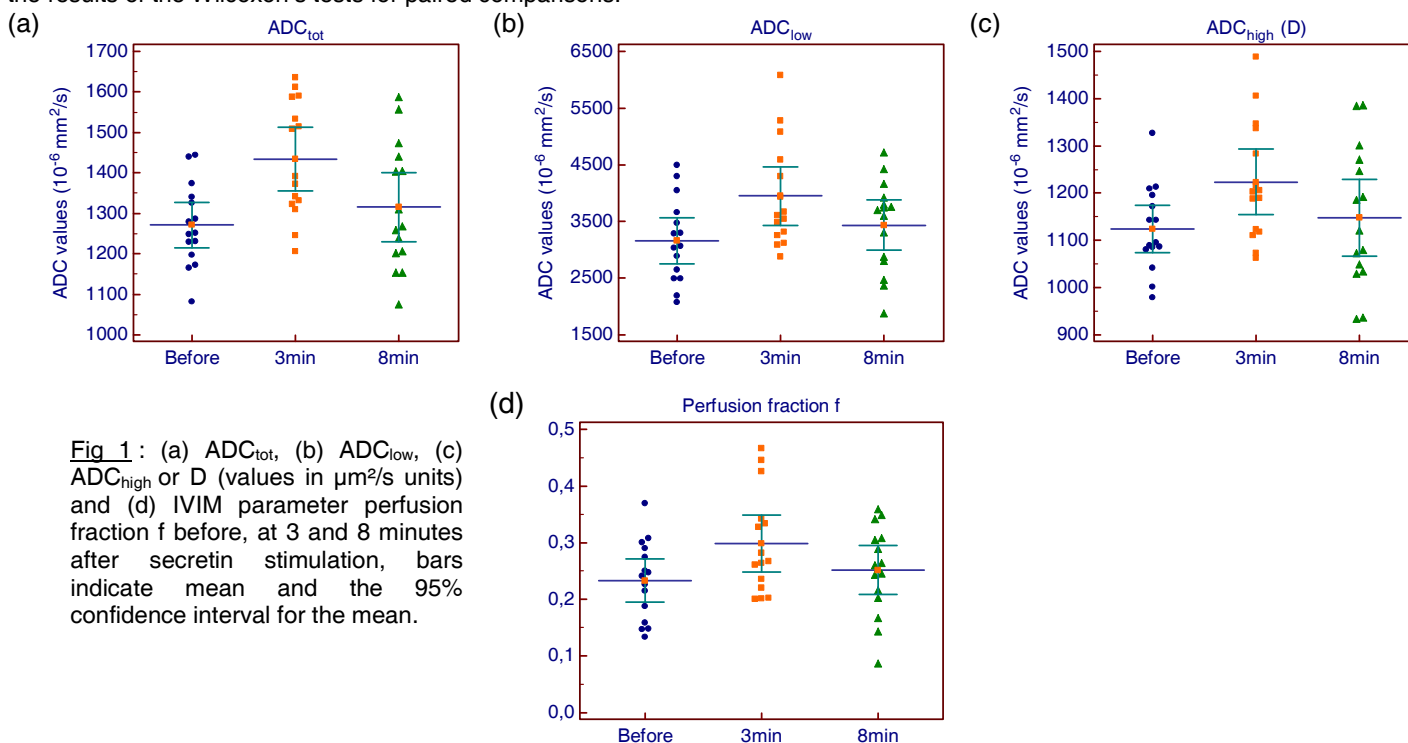
# Effect of secretin stimulation in healthy volunteers at 3T: comparison of mono- and biexponential (IVIM) models in pancreas diffusion-weighted imaging

Julie Absil<sup>1</sup>, Helena Torrao<sup>1</sup>, Thierry Metens<sup>1</sup>, Monia Bali<sup>1</sup>, and Celso Matos<sup>1</sup>  
<sup>1</sup>MRI Unit - Radiology, CUB Hôpital Erasme, Brussels, Brussels, Belgium

**Objective:** To prospectively quantify Intravoxel Incoherent Motion (IVIM) parameters as well as monoexponential DWI parameters in healthy pancreas and assess changes during secretin stimulation.

**Methods:** In this IRB approved study, fifteen healthy volunteers underwent 3T diffusion-weighted SE-EPI MRI (b-values: 0, 25, 50, 100, 500, 1000 s/mm<sup>2</sup>, expiratory triggering) before and at 3 and 8 minutes following secretin injection (1CU/KgBW). Apparent diffusion coefficient (ADC) values were obtained with monoexponential regressions using all b-values (ADC<sub>tot</sub>), b-values from 0 to 100 s/mm<sup>2</sup> (ADC<sub>low</sub>) and b-values from 100 to 1000 s/mm<sup>2</sup> (ADC<sub>high</sub>); perfusion fraction f and pseudo-diffusion coefficient D\* were derived from a biexponential fit according to  $S(b)/S(0) = f \exp(-bD^*) + (1-f) \exp(-bD)$  with D fixed to ADC<sub>high</sub> value.

**Results:** The mean ADC<sub>tot</sub>, ADC<sub>low</sub>, ADC<sub>high</sub> (D) and f significantly increased at 3 minutes after secretin administration: ADC<sub>tot</sub> increased from 1271±101 to 1434±142 μm<sup>2</sup>/s (P<0.001), ADC<sub>low</sub> increased from 3162±737 to 3949±933 μm<sup>2</sup>/s (P<0.001), ADC<sub>high</sub> (D) increased from 1124±90 to 1223±126 μm<sup>2</sup>/s (P=0.003); f increased from 0.23±0.07 to 0.30±0.09 (P=0.012) while D\* significantly decreased from 36203±13378 to 26074±8861 μm<sup>2</sup>/s (P<0.05). All parameters except D\* decreased between 3 and 8 minutes after secretin administration. Fig.1 summarizes the parameters variations and Table 1 and 2 give the mean values of all calculated parameters and the results of the Wilcoxon's tests for paired comparisons.



**Fig 1 :** (a) ADC<sub>tot</sub>, (b) ADC<sub>low</sub>, (c) ADC<sub>high</sub> or D (values in μm<sup>2</sup>/s units) and (d) IVIM parameter perfusion fraction f before, at 3 and 8 minutes after secretin stimulation, bars indicate mean and the 95% confidence interval for the mean.

Mean ±Std Dev	ADC <sub>tot</sub> (μm <sup>2</sup> /s)	ADC <sub>low</sub> (μm <sup>2</sup> /s)	ADC <sub>high</sub> (D) (μm <sup>2</sup> /s)	f	D* (μm <sup>2</sup> /s)
Before	1271 ±101	3162 ±737	1124 ±90	0.233 ±0.069	36203 ±13378
3min	1434 ±142	3949 ±933	1223 ±126	0.299 ±0.090	26074 ±8861
8min	1315 ±155	3434 ±804	1148 ±147	0.252 ±0.079	42423 ±23701

Wilcoxon	ADC <sub>tot</sub>	ADC <sub>low</sub>	ADC <sub>high</sub> (D)	f	D*
<b>0-3min</b>	0.0008	0.0007	0.0031	0.0125	0.0464
<b>0-8min</b>	0.2115	0.1914	0.5321	0.3066	0.8613
<b>3-8min</b>	0.0043	0.0355	0.0736	0.0480	0.0499

**Table 2 :** P values of the Wilcoxon's tests.

**Table 1 :** Mean values (± standard deviation) of calculated parameters.

**Conclusions:** Using both monoexponential and biexponential models, diffusion coefficients and the perfusion fraction increased significantly at 3 minutes after secretin administration, reflecting the expected increase in both perfusion and the exocrine free water release.

**References :** [1] Erturk SM Am J Gastroenterol 2006;101:133-136; [2] Akisik MF. Radiology 2009;252:418-425.