

# Comparison of the ADC measurement in liver DWI with multi-breath-hold, free breathing, respiratory triggered and navigator triggered techniques

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**Introduction and Purpose:** ADC is a promising imaging biomarker for characterizing liver lesions[1] and predicting and monitoring the response of focal or diffuse liver diseases to treatment[2]. However, there's a wide variety in ADCs of liver which have been reported even in normal liver[3]. Therefore, knowledge of the characteristic of ADC measurement in normal liver is of great importance for accurate interpretation of changes in liver ADC. This study is to compare the ADC measurement with different techniques of multi-breath-hold(MBH), free breathing(FB), respiratory triggered(TR)and navigator triggered(NT)DWI and to investigate the effect of anatomical location on the liver ADC measurements.

**Methods:** Thirty-nine volunteers (15 male and 24 female) underwent liver DWI with a 1.5 T MR scanner with MBH, FB, RT and NT techniques (b-values=0, 100, 500 s/mm<sup>2</sup>). Three Region-of-Interest(ROI) (left, middle and right) were drawn on three representative slices (inferior, middle and superior) on the right and left liver lobe respectively on ADC maps. The difference in mean ADC with 4 techniques was assessed by using two-way classification analysis of variance(ANOVA), three-way ANOVA was used to assess difference of superior-to-inferior and left-to-right direction for left lobe and right lobe respectively.

**Results :** Table 1 shows the mean ADC value  $\pm$  standard deviation(SD)of different anatomical location of the liver with 4 techniques. The mean ADC values ( $\times 10^{-3}$  mm<sup>2</sup>/s) with MBH(R: 1.641, L: 2.034) were significantly higher than those with FB(R: 1.389, L: 1.700),RT(R: 1.447, L: 1.755) and NT(R: 1.400, L: 1.736), while there was no statistical difference among FB,RT and NT techniques(P>0.05). There were statistical differences of the ADC values for the right lobe in the left-to-right direction and there were statistical differences for the left lobe both in the left-to-right and the superior-to-inferior direction with 4 techniques.

**Discussion:** The higher mean ADC values of the right and left liver compared with MBH than those with FB, RT and NT maybe due to the different levels of end-expiratory phase with MBH. ADC values in right lobe decreased only along left-to-right direction with FB, RT and NT techniques and ADC values of the left lobe decreased along the left-to-right and superior-to-inferior direction with 4 techniques, these results may be explained by influence of cardiac motion[4].

**Conclusion:** The ADC values are influenced by both the DWI techniques and the anatomical location of the liver and we should use the same technique and the same location when we evaluate the ADC value changes in diffuse liver disease after treatment.

Table 1. The ADC values (10<sup>-3</sup>mm<sup>2</sup>/s) of different anatomical locations of the liver with the 4 techniques

Technique	Location	Right lobe			Left lobe		
		Left	Middle	Right	Left	Middle	Right
BH	Superior	1.720±0.244	1.599±0.198	1.665±0.253	2.424±0.586	2.356±0.474	2.038±0.375
	Middle	1.620±0.239	1.543±0.208	1.668±0.275	2.025±0.399	1.955±0.359	1.812±0.281
	Inferior	1.725±0.24	1.602±0.191	1.629±0.187	1.986±0.379	1.949±0.433	1.761±0.340
FB	Superior	1.598±0.204	1.364±0.159	1.260±0.203	1.904±0.273	1.858±0.315	1.831±0.294
	Middle	1.553±0.205	1.328±0.244	1.282±0.207	1.791±0.362	1.660±0.289	1.593±0.231
	Inferior	1.541±0.188	1.323±0.174	1.252±0.223	1.607±0.244	1.501±0.282	1.534±0.252
RT	Superior	1.597±0.174	1.370±0.159	1.319±0.219	1.965±0.370	2.021±0.416	1.893±0.330
	Middle	1.565±0.174	1.392±0.222	1.354±0.176	1.760±0.260	1.679±0.296	1.639±0.243
	Inferior	1.600±0.168	1.422±0.230	1.405±0.200	1.701±0.239	1.589±0.226	1.548±0.233
NT	Superior	1.584±0.229	1.416±0.183	1.288±0.207	1.929±0.290	1.933±0.295	1.883±0.301
	Middle	1.540±0.176	1.316±0.192	1.320±0.211	1.831±0.327	1.662±0.317	1.646±0.258
	Inferior	1.520±0.175	1.331±0.227	1.290±0.200	1.622±0.300	1.590±0.265	1.529±0.238

**References:** [1]Sandrasegaran, Acad Radiol (2009)[2]Cui, Radiology,(2008)[3]Taouli, Radiology(2010)[4]Kwee, TMAGMA(2009).