PROBLEM STATEMENT

Apparent Diffusion Coefficient (ADC) is an emerging oncology quantitative imaging biomarker obtained from MR imaging [1]. This index might predict tumor aggressiveness and therapy response at baseline [2] notably for brain, breast and prostate tumors.

As for any imaging biomarker, the reliability of the assessment is important [3]. For that purpose, the Quantitative Imaging Biomarkers Alliance (QIBA) published a guideline to assess the reliability of ADC [4].

OBJECTIVES

1. To perform in vitro assessment of ADC measurements reliability and repeatability according to the QIBA guideline.
   - To implement QIBA protocol in collaboration with General Electric Application Engineer.
   - To compare results obtained at our institution and QIBA tolerance.
   - To improve acquisition of diffusion acquisitions and ADC evaluations.

2. In conformity to QIBA guidelines, we aim at establishing thresholds in oncologic routine practice (for diagnostic and prognostic purposes), and for other studies involving healthy volunteers or assessment of chemotherapy response in lymphoma.

METHODS & DATA

Material:
Scanner GE: 1-5T MR450W - Ice-Water phantom acc IEC 61675-1
Head phantom: cover D (3 cylinders Ø 50 mm) - Software ADW VolumeShare 5.4.6

acquisition protocol:
2 NEX per b-value to reach a stable ADC mean value.
0°C water cylinder along B0 field (z axis).
4 passes, 12 minutes between each: b0/b100 – b0/b600 – b0/b800.
1 acquisition at b0/b800 with the 0°C water cylinder along x and y axis.

Study intervention:
Spherical Ø 40mm VOI centered in the 0°C water cylinder.

Measurements:
- Reliability of apparent diffusion Coefficient assessments according to the QIBA guideline
  - H. Beaumont1, B. Moreau2, C. Hoog2, E. Oubel1, A. Iannessi2
  1Median Technologies, Valbonne, France; 2Centre Antoine Lacassagne, Nice, France

Contact: hubert.beaumont@mediantechnologies.com

RESULTS

We obtained results that are within QIBA guidelines:
- ADC reproducibility or Phantom stability (0.9% error).
- ADC measurement accuracy (<6% bias error).
- No significant b-value dependence.

But some values did not meet QIBA expectations:
- Lack of precision, with a high random error, would potentially lead to significant errors in evaluating small tumor target.
- Low SNR revealed an experimental issue.
- Further analysis is needed in order to better match QIBA guidelines.
- Importance of stringent quality control at institutions using ADC.
- Improvements are still necessary to benefit from ADC in oncology.

REFERENCES

Annual Meeting of the RSNA, Chicago


COPENHAGEN, DENMARK | ESMO Congress | 7-11 October 2016