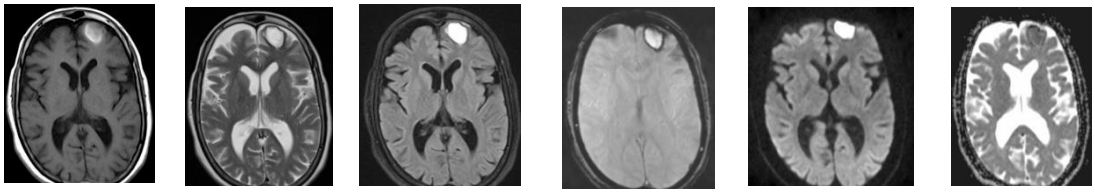
a. Statement of research achievements, if any, on which any award has already been received by the applicant. Please also upload brief citation(s) on the research work(s) for which the applicant has already received the award(s) (not to exceed 2000 words)

I received "Young Investigator Award" for my work on role of Diffusion-weighted MR imaging in evaluation of Intracerebral Hemorrhage (ICH). Brief citation is as under:

- Diffusion-weighted imaging (DWI) is most recognized for its diagnostic utility in ischemic stroke; however, recent attention has focused on other diseases that similarly exhibit restricted diffusion on DWI. DWI of blood clot is of particular interest because hemorrhage may complicate the appearance of ischemic stroke. Although few recent studies using DWI have mainly focused on hyperacute and acute hemorrhages, its clinical reliability for differentiation between hemorrhage and infarction in hyperacute stroke has not been established. Furthermore, the DWI features of various stages of ICH and the underlying biophysical mechanisms have not been clearly addressed. The purpose of this study was to to evaluate the role of diffusion-weighted MR imaging in detection and characterization of Intracerebral Hemorrhage (ICH). We recruited fifty patients with discrete intracranial hematomas proved by CT/GRE or surgery or both were studied by conventional and diffusion MR imaging on a Siemens Magnetom Avanto 1.5-T scanner with hardware for echo-planar imaging. By clinical and imaging criteria, any hematomas due to neoplasm, infarction, or diffuse axonal injury, any of appeared to confound apparent diffusion coefficient (ADC) data were excluded. For diffusion data, multisection single-shot spin-echo diffusion imaging using a diffusion sensitivity of b 1000 s/mm2 were acquired. Diffusion gradients were applied sequentially in three orthogonal directions to generate three sets of axial diffusion-weighted images. From these, average ADC maps were calculated. According to the time interval between commencement of symptoms and initial MRI, five phases were characterized: hyperacute (0-12 hrs); acute (13 hrs-3 days); early subacute (4-7 days); late subacute (8-30 days); and chronic (31 days or more), based on the generally accepted signal intensity patterns as described in the literature. Regions of interest (ROI) were carefully drawn in these areas on calculated average ADC maps, as well as in normal-appearing white matter in all patients. ADC measurements for each type of putative hematoma constituent (intracellular oxyhemoglobin, intracellular deoxyhemoglobin, intracellular methemoglobin, and extracellular methemoglobin) were compared with each other and with normal white matter using an unpaired-t-test.

  FIGURES: Figures below showing left frontal lobe hematoma (Late Subacute Stage) appearing hyperintense on T1-weighted image (A), hyperintense with hypointense rim on T2-weighted/FLAIR image (B,C), peripheral blooming on GRE image (C) and showing diffusion restriction which is seen as hyperintensity on DWI image (E) with corresponding area of hypointensity on ADC map (F).

A B C D E F



- Results of this study showed that Diffusion was reduced in hyperacute, acute, and subacute clots with ADCs being reduced compared with normal brain tissue during all phases. DWI revealed that hematomas were hyperintense at the hyperacute and late subacute stages, and hypointense at the acute, early subacute and chronic stages. In all the cases, focal hypointensity was observed within a hyperacute hematoma. At the hyperacute, acute and early subacute stages, hyperintense rims that corresponded with edema surrounding the hematoma were present. The mean ADC ratio was 0.75 at the hyperacute stage, 0.71 at the acute stage, 0.68 at the early subacute stage, 0.71 at the late subacute stage, and 3.20 at the chronic stage. The marked hyperintensity of hyperacute clot is likely to be associated with restricted diffusion (low ADC). The conspicuous hypointensity of acute and early subacute clots was also associated with low ADC, due to T2- induced hypointensity of clot (ie, "T2 dark-through"). In late subacute clots, signal returned to a hyperintense appearance on DWI as T2 effects dissipated and restricted diffusion persisted. We concluded that Diffusion is reduced in hyperacute, acute, and subacute clots. Reduced ADC accounts for the marked hyperintensity on DWI scans in hyperacute and late subacute phases. Despite restricted diffusion, signal intensity on DWI is not increased in the intervening acute and early subacute phases because of T2- induced hypointensity of clot, which dominates signal intensity on DWI (ie, "T2 dark-through").

REFERENCES

1. Atlas SW, Dubois P, Singer MB, Dongfeng L. Diffusion measure- ments in intracranial hematomas: implications for MR imaging of acute stroke. *Am J Neuroradiol* 2000;21:1190–1194.

2. Maldjian JA, Listerud J, Moonis G, Siddiqi F. Computing diffusion rates in T2-dark hematomas and areas of low T2 signal. *Am J Neuroradiol* 2001;22:112–118

3. Kang BK, Na DG, Ryoo JW, Byun HS, Roh HG, Pyeun YS. Diffusion-weighted MR imaging of intracerebral hemorrhage. *Korean J Radiol* 2001;2:183–191