

# Looking for the ‘Spot Sign’: Enlightening the Management of Intracranial Hemorrhage



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*“The first requisite for success is to develop the ability to focus and apply your mental and physical energies to the problem at hand without growing weary...”.*

*Thomas A. Edison (inventor; 1847-1931)*

Imaging continues to be a key element of stroke diagnosis, management, and research. Although several advances happened in ischemic stroke,<sup>1-4</sup> no significant growth occurred in intracerebral hemorrhage. In the last decade, for instance, there were 15,156 studies on “imaging” and “ischemic stroke” or “cerebral infarction” whereas only 1911 articles on “imaging” and “intracerebral hemorrhage” or “hemorrhagic stroke” published in Pubmed (accessed March 30, 2009). Moreover, recent results from a randomized trial using recombinant activated factor VII (rFVIIa) or placebo to prevent hematoma enlargement (the most fearful complication associated with increased morbidity and mortality) showed no significant difference.<sup>5,6</sup> As a result, the enthusiasm (and the excitement observed in other colleagues) for the routine use of Factor VII has dissipated. The optimism was recently regained with the hand of neuroimaging. The finding of contrast extravasation on CT angiography, named “spot sign”, showed to predict hematoma expansion.<sup>7</sup> Therefore, the selection of patients based on contrast extravasation into the clot after CT angiography was considered a promising approach for the management of patients with ICH.

The question is how best to define the “spot sign” for future research and clinical applicability. In the present article, Dr. Thompson and colleagues<sup>8</sup> provide us with an answer. This report is based on a prospective multicenter cohort study, named PREDICT (Predicting hEmatoma growth and outcome in Intracerebral hemorrhage using contrast bolus CT), aimed at evaluating the use of CT angiography in predicting hematoma growth and functional outcome in spontaneous intracerebral hemorrhage patients presenting within six hours of symptom onset. The present study included 36 consecutive patients presenting with primary intracerebral hemorrhage (ICH). The authors proposed radiological criteria of the CTA ‘spot sign’ and described the size, morphology and radiological patterns.

## **What have we learned?**

First, one third of patients had 19 enhancing foci consistent with the CTA ‘spot sign’. Second, the average axial size was  $3.7 \pm 2.2$  mm. Third, differences in age, blood pressure, glucose, INR/PTT, or hematoma location didn’t appear to be associated

with the ‘spot sign’. However, the small sample size may not allow for detecting difference between patients with and without the “spot sign”.

Fourth, from saccular and fusiform to lipohyalinotic aneurysms, a pathological correlate with the ‘spot sign’ has been described. It is believed that lipohyalinosis of the arterial wall in the context of severe hypertension lead to an elongated aneurysmal dilatation, thus predisposing to a traumatic vessel disruption.<sup>8-10</sup>

The authors proposed a definition for use in clinical and research studies. They suggested that “spot sign” be defined as a spot-like and/or serpiginous foci of enhancement, within the margin of a parenchymal hematoma without connection to outside vessels, greater than 1.5 mm in maximal dimension and has a Hounsfield unit density at least double that of background hematoma density.<sup>8</sup>

The group has also recently published another study looking at the sensitivity of the “spot sign” to predict hematoma enlargement. They completed a post-contrast CT and a CTA in 61 patients presenting within six hours of primary ICH onset. Hematoma expansion was defined as >6 mL or 30% hematoma enlargement. They found post-contrast leakage (PCL) in 11/61 patients (18%), occurring in five without a spot sign (45%). The inclusion of PCL together with CTA spot sign increased the sensitivity from 0.78 (95% CI; 0.52 to 0.94) to 0.94 (95% CI; 0.72 to 1.00) and the negative predictive value from 0.90 (95% CI; 0.76 to 0.97) to 0.97 (95% CI; 0.85 to 1.00) in the detection of hematoma expansion.

Last, but not the least, the presence of the CTA “spot sign” not only correlates with the expansion of the hematoma, but also with clinical outcomes.<sup>11</sup> The spot sign in ICH was reported in 33% of patients within three hours and 20% within ten hours, suggesting a reduction in the risk of extravasation with time.<sup>11,12</sup>

## **Where are we going?**

The nihilistic era regarding the management of ICH has ended. Promising therapies might be available if we are able to carefully select the appropriate candidates. The CTA “spot sign” may facilitate patient selection. We hope that the information provided by new imaging techniques and the results of randomized trials help us in optimizing the treatment of a life-threatening and disabling medical condition, intracerebral hemorrhage.

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