Early lowering of blood pressure (BP) may be beneficial for preventing hematoma growth. However, relationships between timing of BP lowering and hematoma growth in ICH remain unclear.

The Stroke Acute Management with Urgent Risk-factor Assessment and Improvement (SAMURAI)-ICH Study was a multicenter, prospective, observational study investigating the safety and feasibility of early (within 3 h from onset) reduction of systolic BP (SBP) to < 160 mm Hg with intravenous nicardipine for acute hypertension in cases of spontaneous ICH. The present study was a post hoc analysis of the SAMURAI-ICH study. We examined relationships between time from onset, imaging, and initiation of treatment to target SBP achievement and hematoma growth (absolute growth ≥6 mL) in ICH patients. Target SBP achievement was defined as the time at which SBP first became < 160 mm Hg.

Among 211 patients, hematoma growth was seen in 31 patients (14.7%). The time from imaging to target SBP and time from treatment to target SBP were significantly shorter in patients without hematoma growth than in those with ($p = 0.043$ and $p = 0.032$ respectively), whereas no significant difference was seen in time from onset to SBP < 160 mm Hg between groups ($p = 0.177$). Patients in the lower quartiles of time from imaging to target SBP and time from treatment to target SBP showed lower incidences of hematoma growth (p trend = 0.023 and 0.037 respectively). The lowest quartile of time from imaging to target SBP (< 38 min) was negatively associated with hematoma growth on multivariable logistic regression (OR 0.182; 95% CI 0.038-0.867; $p = 0.032$).

Large ICHs were significantly more irregular in shape, heterogeneous in density, and had greater growth. Density heterogeneity independently predicted ICH growth using some definitions [1].

The inconsistency in findings may be caused by ambiguous definition of irregular shape.

Very small hematomas are unlikely to expand and have a low spot sign prevalence. Hemostatic therapy trials may be best targeted at hemorrhages >3 mL in volume [2].

Compared with previously reported predictors for hematoma expansion on non-enhanced CT, such as blend sign, black hole sign and heterogeneous density, CTA spot sign has better predictive accuracy for hematoma expansion [3] [4] [5].

However, CTA is not available to all medical centers, especially in some remote areas and non-enhanced CT is sometimes the only emergency neuroimaging examination for spontaneous ICH patients. Thus, it is still important to investigate predictors for hematoma expansion on non-enhanced CT.

A non-enhanced computed tomography (CT) based finding, termed the 'satellite sign', was reported to be a novel predictor for poor outcome in spontaneous ICH. However, it is still unclear whether the presence of the satellite sign is related to hematoma expansion.

Initial computed tomography angiography (CTA) was conducted within 6h after ictus. Satellite sign on non-enhanced CT and spot sign on CTA were detected by two independent reviewers. The sensitivity and specificity of both satellite sign and spot sign were calculated. Receiver-operator analysis was conducted to evaluate their predictive accuracy for hematoma expansion.

This study included 153 patients. Satellite sign was detected in 58 (37.91%) patients and spot sign was detected in 38 (24.84%) patients. Among 37 patients with hematoma expansion, 22 (59.46%) had satellite sign and 23 (62.16%) had spot sign. The sensitivity and specificity of satellite sign for prediction of hematoma expansion were 59.46% and 68.97%, respectively. The sensitivity and specificity of spot sign were 62.16% and 87.07%, respectively. The area under the curve (AUC) of satellite sign was 0.642 and the AUC of spot sign was 0.746. (P=0.157)

The results suggest that the satellite sign is an independent predictor for hematoma expansion in spontaneous ICH. Although spot sign has the higher predictive accuracy, satellite sign is still an acceptable predictor for hematoma expansion when CTA is unavailable

Yu et al. compared the predictive values of spot sign and satellite sign for hematoma expansion. Compared with satellite sign, spot sign had higher sensitivity and specificity. In addition, spot sign had a larger AUC than satellite sign, but no significant difference existed. Thus, CTA spot sign seems to be a better predictor for hematoma expansion in spontaneous ICH patients, but satellite sign is still an acceptable predictor for hematoma expansion when CTA is unavailable.

The study has several limitations. First, this was a retrospective study with limited sample size in a single medical center. Second, the association between satellite sign and prognosis was not investigated because of insufficient follow-up data. Furthermore, the onset-to-CTA time was relatively long, which could influence the predictive accuracy of both spot sign and satellite sign.

In conclusion, the study demonstrated that the satellite sign was an independent predictor for hematoma expansion in spontaneous ICH patients. Spot sign has higher accuracy for predicting hematoma expansion, but the satellite sign is still an acceptable predictor when CTA is unavailable. Further multi-center, prospective studies with larger sample sizes are still needed to confirm the utility and validity of the satellite sign in predicting hematoma expansion in spontaneous ICH patients [6].

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