

Island Sign: An Easy Access Way to Predict the Functional outcome of Patients with Intracranial Hemorrhage

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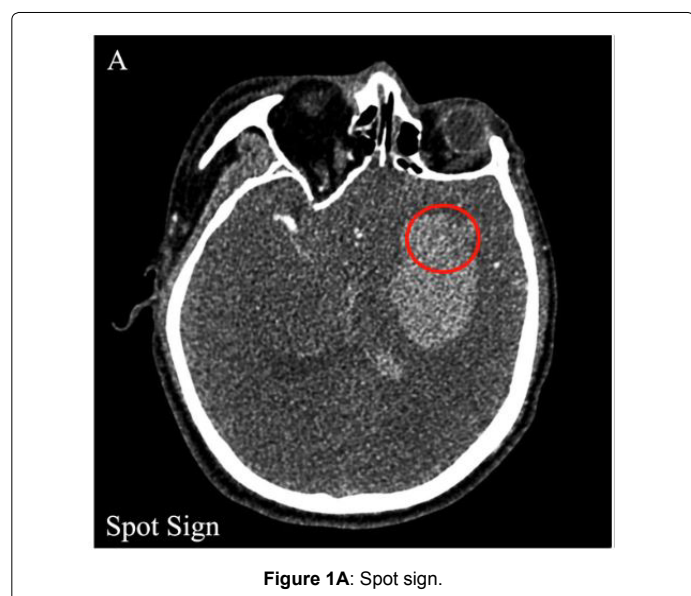
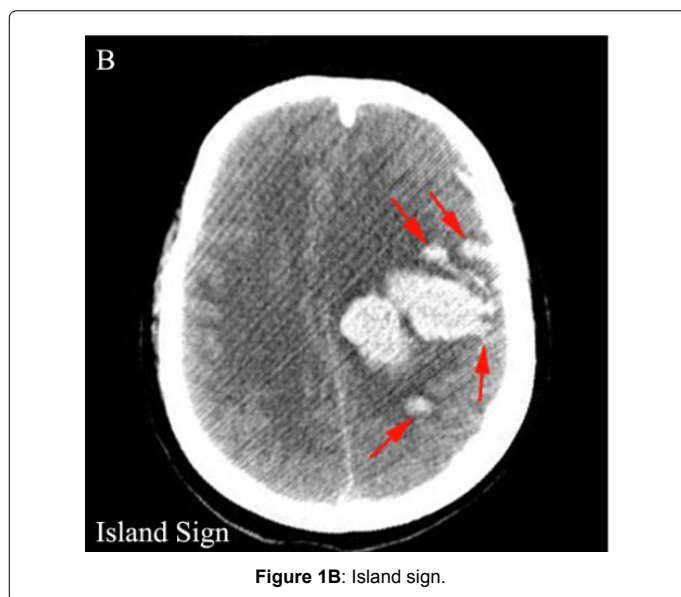
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Commentary

It is well documented that the existence of hematoma expansion is a potent sign for poor prognosis of patients with intracranial hemorrhage (ICH) [1]. Current clinical studies have already revealed the effectiveness of spot sign in predicting early hematoma expansion, as well as the functional outcome of ICH patients [2] (Figure 1A). However, due to inadequate equipment and supplies at emergency unit and walk-in clinic in some developing countries, spot sign screening could not be performed at early stages of initial ictus (within 24 hours) by using computed tomography angiography (CTA) in many cases. Nevertheless, island sign from Non-Contrast Computed Tomography (NCCT) is widely used and relatively easier to be obtained at pre-admission period in many developing countries, including China [3,4,5] (Figure 1B). Island sign is one of the most commonly observed NCCT sign in China and in literature regarding early NCCT hematoma expansion signs. Despite the fact that island sign is a well-established hematoma expansion predictor, limited studies have focused on the comparison of this neuroradiological feature with spot sign, as well as its potential predictive value in the prognosis of patients with ICH. Therefore, we investigated the predictive ability of island sign in short-term prognosis of ICH patients, and also compared this NCCT based parameter with spot sign to further dissect the predictive value in poor outcome of patients with ICH [6]. Indeed, other than island sign and spot sign, accumulating studies indicated that many NCCT and CTA based image parameters could predict hematoma expansion [4,5,7,8-12]. For example, tail sign and leakage sign from CTA results are reported to independently predict hematoma expansion with certain conditions [8,9]. The authors [3-5,7,10-13] demonstrated the predictive abilities of some radiological features from NCCT for partially indicating the expansion of hematoma in patients with ICH. However, the most reliable predictor for hematoma expansion and poor prognosis of ICH patients [9] remains to



be spot sign, which possesses the best specificity and comparable sensitivity with all other signs [6]. Previously studies indicated that neuroradiological features from NCCT exhibited limited predictive values for hematoma expansion, and the potential correlation between NCCT based signs and functional outcomes in ICH patients could only be observed under certain conditions [14]. Up to date, limited studies are focused to reveal whether the functional outcomes of ICH patients could be reliably predicted by NCCT signs, even they bear a resemblance to spot sign for hematoma expansion [14,15]. Thus, based on the cases from our institution, we retrospectively compared the predictive abilities of the most observed island sign from NCCT on short-term prognosis in ICH patients with spot sign. The results indicated a comparable predictive value between island sign and spot sign on short-term prognosis of ICH patients [6]. Actually, similar studies on the predictive abilities of other NCCT signs were previously reported [14-18]. Moreover, other than the predictive abilities of hematoma expansion,

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blend sign and hypodensity were indeed to have illegible relationships with poor prognosis from further multivariate analysis [3,13-16]. Nevertheless, by using univariate analysis and multivariate analysis, our results possessed a relatively stable predictive value than other radiological parameters. Therefore, our current retrospective study proposed that island sign could be added as a candidate for evaluating the outcomes of ICH patients. And we also believe this finding could shed a light specifically on the use of island sign from preadmission exam in predicting poor prognosis of ICH patients.

As a retrospective study with limited case numbers (283 enrolled patients), we could not exclude a potential bias in patient selection, especially all patients were from single institute. In fact, Wada et al reported an alternative sensitivity of spot sign compared with our result [17-19]. In considering with the results from Li et al. and Yu et al, as well as different ethics of patients, we believe it is a considerable disparity in retrospective studies from different regions [3,17,18]. Additionally, we aim to accumulate more cases in our future studies to further enhance the predictive value of island sign in ICH patient's functional outcomes. Notably, other radiological signs, which shares the same potential conditions of formation with island sign, could also be considered to bear the similar predictive value in the prognosis of patients with ICH [5,14,15,20]. Shimoda et al. suggested that satellite sign exhibits certain similar criteria with hypodensity sign and some other signs for the premise of low-density cytotoxic edema [7]. All those evidences provided a possibility for other radiological signs from NCCT, regardless of its contrast extravasation nature or mixed density nature, to have correlation in predicting the outcomes of ICH patients [3,5,7,17,18,20]. Further study focused on specifying the correlation between NCCT signs in prognosis prediction is still in need.

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