

Characterization of intra-thalamic regional involvement in patients born term with hypoxic-ischemic injury

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Purpose

MRI patterns described in **TERM** hypoxic-ischemic injury (HII) are based on duration and severity of the hypoxic-ischemic event - basal ganglia thalamus [BGT], watershed [WS], and combined). The ventrolateral thalamus is characteristically involved in BGT injury, but it is not clear if involvement of other components, such as the pulvinar represent the same process when these co-exist with cerebral hemispheric involvement. **We aimed to characterize and compare the frequency of regional intra-thalamic involvement according to on the different hypoxia-ischemia patterns.**

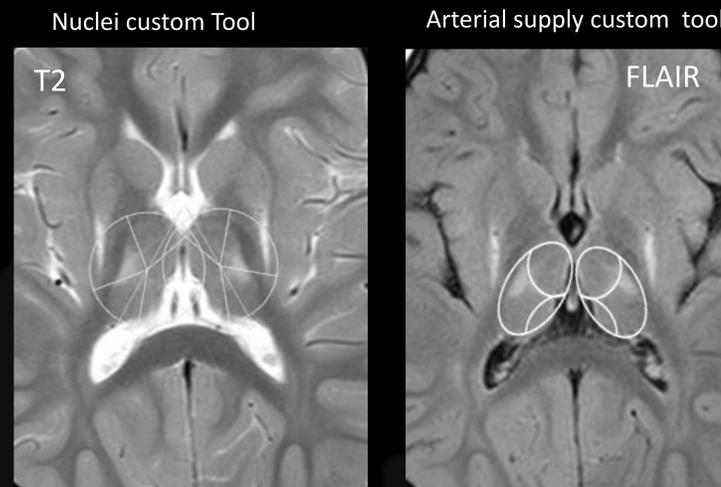
Methods

We evaluated 57 children with history of HII and thalamic involvement on delayed brain MRI. Cases of insufficient quality and patients with severe structural abnormalities affecting the thalami were excluded. Two custom tools were placed over the thalami on axial T2-W and FLAIR images to determine distribution of intra-thalamic involvement:

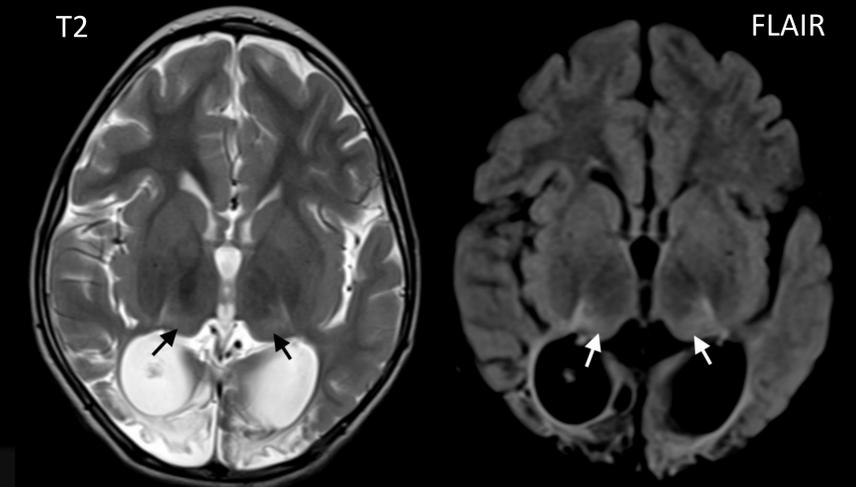
6 subjective zones: whole/near-whole, central, anterior, posterior, lateral, medial
4 nuclei groups: anterior [AN], ventrolateral [VLN], median [MN], and pulvinar [PN]
3 arterial regions: thalamo-perf [TPA], thalamo-genic [TGA], posterior choroid [PCA]

We compared frequency of thalamic territory involvement between HII pattern groups (BGT, WS, and combined).

12-year-old girl with BGT HII pattern and VLN injury

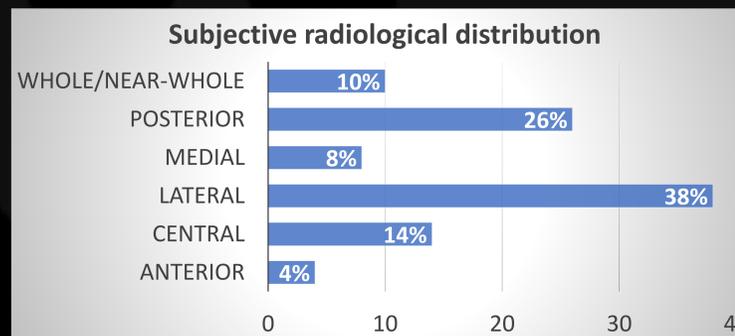


4-year-old girl with WS HII pattern and PN injury



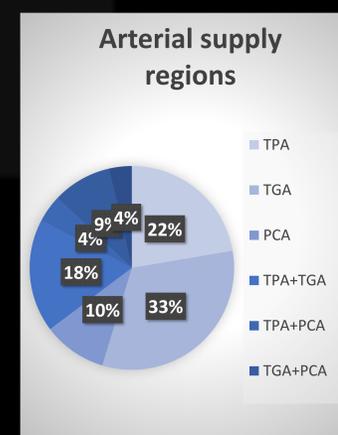
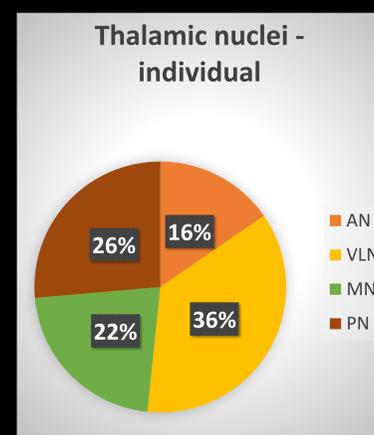
Results

- 50 patients (mean age 7.04±3.78 years).
- 27 BGT group, 10 WS group, 13 combined group.
- Lesions were bilaterally symmetric in 98%.



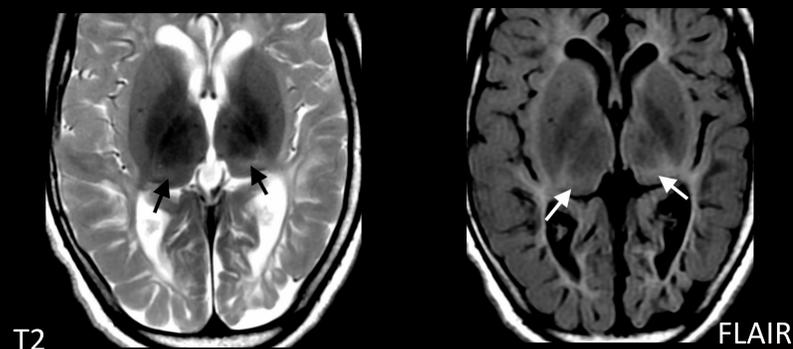
VLN injury occurred more frequently in the BGT group ($p < 0.05$), PN in WS group ($p < 0.05$), and AN MN in the combined group ($p < 0.05$).

- TPA was more involved in the BGT group ($p < 0.05$), and PCA in WS group ($p < 0.05$).



Conclusion

- Statistically significant differences in the frequency of thalamic nuclear and arterial regional injuries between the BGT and WS types of HII likely represent different pathogenetic mechanisms relating to severity and duration of the insult.
- The combined group also demonstrated differences to the pure BGT and WS injury groups, suggesting that thalamic injury in this group may be due to:
 - a) the pre-existing partial prolonged HII modulating the distribution of acute phase BGT injury,
 - b) an additional pathology in partial prolonged insults, such as hypoglycemia involving the thalamic pulvinars, or
 - c) delayed Wallerian degeneration in the thalamocortical circuits.



5-year-old girl with posterior WS HII and PN injury