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Thrombolytics in Pediatric Stroke: Imaging Modalities

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Abstract

We report the importance of the hyperacute MRI and collaborative decision-making process for acute ischemic stroke, particularly, in pediatrics. For patients who present with clinical features suggestive of an acute ischemic stroke, there is concern of utilizing thrombolysis given the possibility of treating a mimic.

A case of pediatric management with intravenous tissue plasminogen activator (IV tPA) is referenced to emphasize its efficacy in children, and to highlight the diagnostic difficulties associated with the care of pediatric patients with suspected stroke.

Introduction

- Stroke is among the **top 12 causes of death** in children. It is an under recognized condition that **is associated with long-term neurological deficits** and a **mortality rate of ~ 10%**¹⁻⁵
- While the use of IV tPA has been proven to be effective in the adult population, its role in pediatrics remains uncertain.
- The recommended time window of 4.5 hours from symptom onset to administration may not allow for a correct diagnosis⁶
 - Pathophysiology underlying pediatric stroke is distinct⁷⁻⁹
 - Timely identification of stroke is complicated by nonspecific symptoms and the numerous prevalent stroke mimics in children⁷⁻⁹
- Neuroimaging is an important tool used for diagnosis and the safety of administering tPA⁶

Case Summary

A 14-year old female with a history of (right or left) thalamic stroke who presented with neurological symptoms consistent with acute stroke. On initial read, MRI of her brain was indeterminate and showed no frank evidence of cerebral infarction. Further inspection showed an area of restricted diffusion which clinically correlated to her symptoms in the dorsal aspect of the left midbrain. There was no evidence of vessel wall irregularities, high grade stenosis or dissection. This patient was administered tPA over the course of 1 hour and the following day, her symptoms resolved.

Discussion

- Up to 2% of children with acute stroke who qualify for thrombolytic treatment have reported treatment with tPA¹⁰
- IV tPA has been the main intervention for the management of pediatric stroke and has shown good outcomes
 - However, data on safety is lacking due to a shortage of randomized controlled trials in children with stroke¹⁰
- Accurate and timely diagnosis is of great importance to minimize significant neurologic deficits
- A joint decision-making process with both a pediatric neurologist and vascular neurologist are recommended due to frequent stroke mimics in children
- Use of hyperacute MRI (hMRI) for a more effective informed management decision is appropriate as it has been demonstrated to quickly and accurately identify ischemic stroke within minutes¹²
- To facilitate appropriate neuroimaging, we have proposed a standardized diagnostic imaging flow chart [See Figure 1]

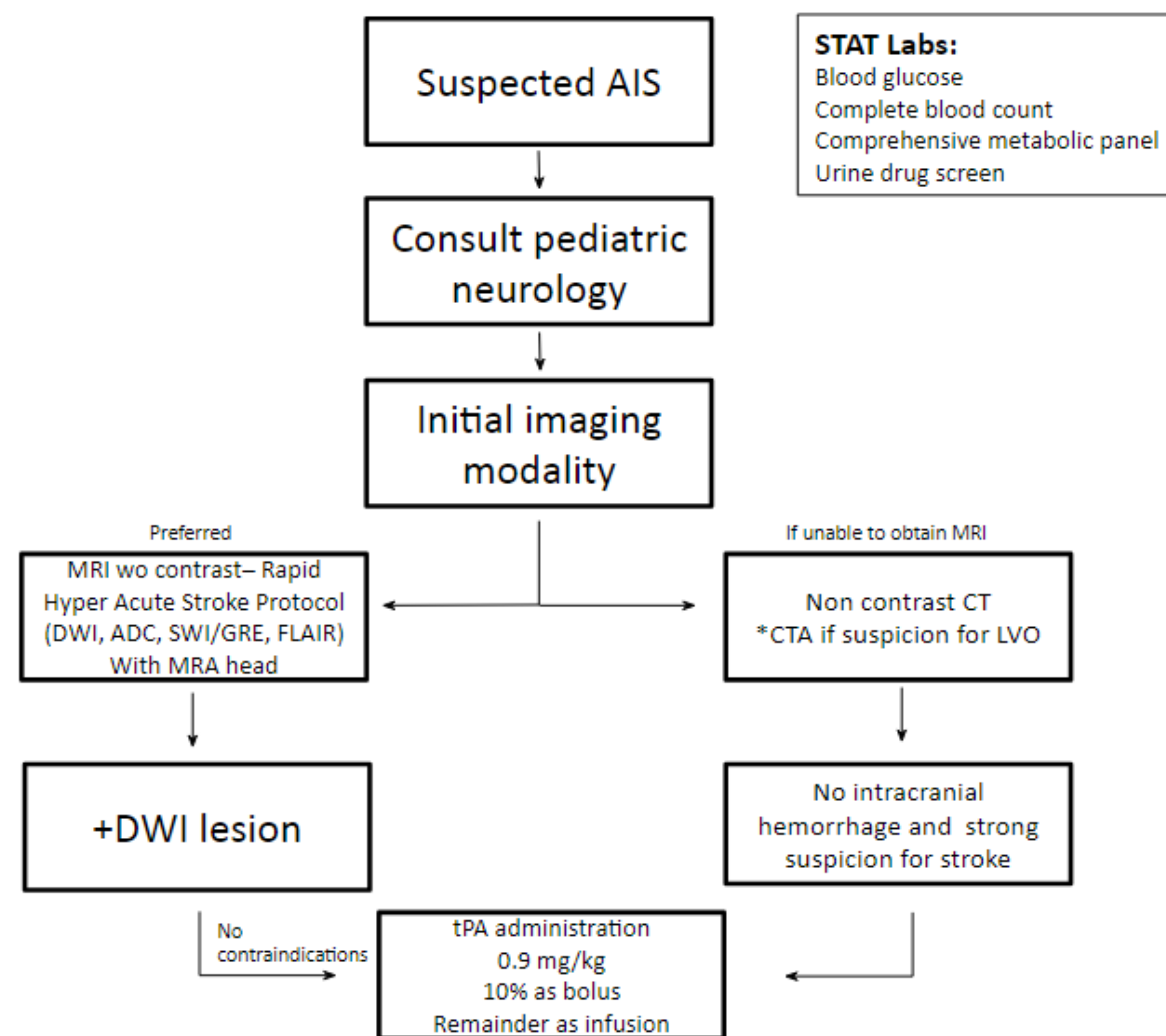


Figure 1: Proposed imaging and treatment algorithm in pediatric patients with suspected stroke

Conclusion

- With an incidence of 2.5-13 people per 100,000, pediatric stroke is often under-recognized, delaying diagnosis and precluding time-sensitive tPA treatment for many who may benefit¹¹
 - Up to 40% of pediatric cases are given an incorrect initial diagnosis of stroke mimics¹³
- tPA administration in pediatric populations suspected of acute stroke is not well established but has yielded good outcomes
- While MRI is known to have good sensitivity and specificity, careful observation is warranted due to the frequency of false negatives of subtly apparent areas of restricted diffusion and misdiagnosis in the hyperacute setting¹⁰
- hMRI should be considered and used as an adjunctive screening tool for effective informed management in patients suspected of stroke to quickly enable tPA treatment when appropriate

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