STROKE AND HEMICRANIECTOMY

INTRODUCTION

Clinically significant cerebral swelling in ischemic stroke is expected in the setting of large vascular territory involvement although the timing of its presentation can be quite variable.[1] Most of the literature on the development and management of this complication is derived from several RCTs examining the role of decompressive craniectomy (DC) for malignant middle cerebral artery infarction in adults.[2 3 4] In these studies the overall pooled mortality benefit of decompressive craniectomy was 49% and the percentage of survivors with a good outcome was improved by a more modest 22%.[1] Available literature in children is limited to retrospective observation cohort studies and case series; however, the incidence of malignant middle cerebral artery infarction in pediatrics is estimated to represent approximately 1.3% of the total incidence of acute ischemic stroke in the same population.[5] As a result this guideline out of necessity is largely extrapolated from adult evidence with the caveat that the risk of clinically relevant swelling may be greater in younger children with a higher brain-to-skull ratio.

MANAGEMENT, CONSIDERATIONS & RECOMMENDATIONS

- Inclusion criteria for adult patients into the three published RCTs of DC in MMCAI were a middle cerebral artery vascular territory involvement of ≥ 50 – 66%. As a result, a conservative recommendation is for **all children with greater than 50% MCA territory infarct should be closely observed ideally in a PICU environment for clinical progression that may warrant neurosurgical intervention. Other radiographic features that warrant similar observation include cerebellar and uncal strokes which confer greater risk of obstructive hydrocephalus or foramen magnum herniation**.[1]

- Timing of malignant transformation of a large MCAI is variable in adults and can follow a fulminant course within the first 24 hours, or occur more gradually over several days. Decompressive craniectomy in adults beyond 96hrs has not been shown to be effective.[1] However, in a large retrospective study in children, for two of the children a DC was done quite late, at 6 and 12 days, but in both of these cases a vasculopathy was identified that may predict a more variable and prolonged course with ongoing growth in infarct volume.[5] Of note a meta-analysis of patients undergoing DC within 48hrs showed that these patients had improved mortality and morbidity. **Thus a conservative period of observation for deterioration in a PICU setting is 72-96hrs post stroke adjusted to patient characteristics/etiology**.

- Indication for DC in at-risk patients is based almost entirely on clinical characteristics although imaging is important to exclude hemorrhagic transformation or other diagnostic considerations based on patient characteristics and reversible causes such as a hyponatremia or seizures. The optimal trigger for DC is not well understood. An NIH Stroke Scale (NIHSS) score of ≥16 has been used in adult RCTs as an indication for DC; however, a change in level of consciousness seems to be only component (1a) of the NIHSS that is useful in timing of DC and so this is reflected in the 2014 AHA/ASA Recommendations,[1] that state: "it is reasonable to use a decreased level of consciousness and its attribution to brain swelling as a selection criteria". **Similarly the timing of DC in children should be performed early enough to prevent a herniation syndrome and so a deterioration in the LOC not due**

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to other reversible is a reasonable threshold. A pediatric modification to the NIHSS called the PedNIHSS shows excellent inter-rater reliability facial weakness, ataxia and dysarthria in addition to level of consciousness[6] and is a useful tool to monitor for earlier deterioration that may influence monitoring thresholds and may help to refine the timing of decompressive craniectomy. A copy of the Peds NIHSS is available in the associated reference below[7] and can be printed and placed at the bedside or in the patient's chart to be used by the neurology service to document changes in stroke progression.

REFERENCES

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