Pediatric Blunt Cerebrovascular Injury: Identifying Common Symptomatologies to Improve Screening Guidelines A Literature Review and Case Study

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Pediatric Blunt Cerebrovascular Injury: Identifying Common Symptomatologies to Improve Screening Guidelines— A Literature Review and Case Study

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Introduction

- BCVI is a rare, but serious, non-penetrating injury to the extracranial carotid or vertebral arteries
- Methods of injury: motor vehicle accident, struck pedestrian, fall from low heights, blunt force
- Neurologic symptoms often delayed 10-72 h post injury
- Adult screening criteria: Denver and Memphis criteria, EAST guidelines
- Imaging: CTA has highest sensitivity[2], DSA, or MRA

Gaps in the Literature

- No guidelines for screening, diagnosis, and treatment specific to pediatric population
- As many as 66% of pediatric patients experiencing stroke from BCVI do not meet adult screening criteria[1]
- 1 in 6 screening CTAs identify BCVI, with a clinically significant BCVI identified 1 in 33 CTAs[1]

Objectives

- To identify common symptomologies associated with a positive and negative CTA
- Better identify patients at risk for having an injury

Methods

Review literature through ClinicalKey database	Relevant ICD codes and diagnoses	IRB proposal	Case reports	Future: Analyze clinical and radiographic data of 1,675 patients, selected from LVHN database from 2010-2020

Literature Review

Demographics	Radiographic findings	Conclusions
558 underwent CTA, 96 had BCVIs	• **Denver criteria lowest false neg rate** • 52% spine fracture (40% cervical)	• Pharmacotherapy remains unclear • Injuries between toddler and near-adult adolescent differ. **A unified pediatric screening tool is not reasonable**[1]
463 patients underwent CTA, 152 had blunt trauma	• **All patients with BCVI had at least 1 nonvascular injury**	• **Cervical seatbelt sign not associated with BCVI** • With BCVI, **mean GCS score= 8.67** versus 12.92 in patients without BCVI[3]
645 patients underwent CTA, 52 diagnosed with vascular injury	• 72% received treatment in the form of ATT • **No complications identified after antiplatelet or anticoagulant administration**	• Delayed stroke or injury progression in Grade I PBCVI is low • Treatment with antiplatelet or anticoagulant therapy is safe • **Presenting GCS, vascular injury grade, and additional intracranial injury are most important predictors of poor outcome** • **Mean GCS=8** [4]

Conclusions

- Contrary to literature, both patients needed CTA even with a GCS score of 15
  - Neurologic deficits not necessary for BCVI
- Similar to literature, both displayed at least 1 non-vascular injury
  - Use of aspirin in patient 1 presented no complications

Case Studies

Age, Sex	Method of injury	Symptoms	Imaging	Diagnosis	Meds	Surgery	Further compli-cations
4, male	ATV rollover	**GCS 15**, bruising/abrasion on neck and R shoulder, **no loss of consciousness,** hoarse voice, **POx 100%**	CT head CTA neck CT cervical spine MRI cervical spine MRA neck	• Small cortical infarct in L occipital lobe with few punctate satellite infarcts • **Acute vascular injury** involving the origin of proximal **L common carotid artery with intramural hematoma, 50% narrowing** • **No cervical spine fracture** or ligamentous injury	**Aspirin** 81mg	No	No
7, male	Motor vehicle accident	**GCS 15**, extensive **facial trauma and fractures, epidural hematoma, frontal skull fracture**, fracture of right iliac crest, orbital deformity of right eye due to trauma, orbital fracture,	CT head CT maxillofacial CT brain CT 3D head 1 week follow-up XR C Spine 1-month XR C Spine 3-month CT 3D head	• **Epidural hematoma** • **Multiple facial fractures** and bilateral orbital injuries • No new or expanding sites of intracranial hemorrhage	Pain relief	Knee and maxillofacial	No

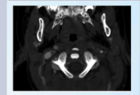

Fig 1. CTA of the neck demonstrating occlusion of the left internal carotid artery injury

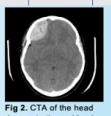

Fig 2. CTA of the head demonstrating epidural hematoma

Future Directions

- Compose a comprehensive list of risk factors to be used in the screening process of pediatric patients with suspected BCVI, using the 1,675 charts that fit our search criteria
- Implement screening guidelines at LVHN trauma centers

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