Effectiveness of Imaging Markers on Noncontrast Computed Tomography (CT) in Predicting Early Epidural Hematoma Growth

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Disclosures

• The authors have nothing to disclose.
Introduction

- Epidural hematoma is most often caused by rupture of the middle meningeal artery
  - secondary to head trauma
  - fracture of the temporal bone
- Progressive Epidural Hematoma (PEDH) can be fatal and imaging is often the chief determinant in the decision to perform surgical intervention – Predictive factors are necessary
  - Existing: CT Blend, Swirl, Spot
  - Proposed: Intradural Air, Involvement of Skull Base Fx, Displaced/Comminuted Fx

Fig 1. Right Parietal Epidural Hematoma; Computed Tomography
Methods

• Retrospective Case Review
  • Patients 0-18 from 2012-2019 who underwent a baseline CT scan within 6 hours after hospital admission or presentation of symptoms, whichever occurred first, and a follow-up CT scan within 24 hours of the baseline
  • Two separate health systems

• Radiology reviewed for existing and proposed markers, hematoma size, and outcomes of intervention
  • Hematoma size compared between initial and first follow-up imaging studies
Fig 2. Epidural Hematoma with CT Blend Sign; Computed Tomography

Fig 3. Epidural Hematoma with CT Swirl Sign; Computed Tomography

Fig 4. Epidural Hematoma with CT Spot Sign; Computed Tomography

Fig 5. Epidural Hematoma with Intradural Air; Computed Tomography

Fig 6. Epidural Hematoma with fracture of the Skull Base; Computed Tomography – Bone Window
## Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>p-Value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intradural Air*</td>
<td>1.000</td>
<td>Not Significant</td>
</tr>
<tr>
<td><strong>Fracture Involving the Skull Base</strong>*</td>
<td>0.014</td>
<td>Significant</td>
</tr>
<tr>
<td>Comminuted Fracture**</td>
<td>0.033</td>
<td>Significant</td>
</tr>
<tr>
<td>Displaced Fracture*</td>
<td>0.748</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

n=28; p<0.05

*Specifically the length measurement of the hematoma
**Specifically the transverse measurement of the hematoma
# Results

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<thead>
<tr>
<th>Parameter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Blend Sign</td>
<td>T: 0.747, L: 0.494, H: 0.641</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Swirl Sign</td>
<td>T: 0.186, L: 0.092, H: 0.712</td>
<td>Not Significant</td>
</tr>
<tr>
<td>Spot Sign</td>
<td>T: 0.762, L: 0.704, H: 0.762</td>
<td>Not Significant</td>
</tr>
</tbody>
</table>

n=28; p<0.05
Discussion

- Complexity of the fracture (involvement of skull base and comminuted status) appeared to be the only significant determinant of epidural hematoma growth in our pilot cohort*

- The presence of intradural air and displaced fractures were not statistically correlated to progressive hematoma growth in this group of patients

- Given the lack of predictive significance of the traditional CT markers in our cohort, further research may be necessary to determine whether these signs are as useful in the pediatric population as they have been in adults

*Specifically the length and transverse measurements, respectively
Future Directions

Due to the small sample size, we hope to expand our cohort to include adult PEDH patients and further test the predictive value of our proposed parameters.
Thank You.

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