Positional Posterior Plagiocephaly: Determining a Clinical CVAI Correlation

Poster ID:1472

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Introduction

- Plagiocephaly is a non-synostotic unilateral flattening of the occiput associated with facial asymmetry\(^2\).
- Infant positioning during sleep and play have been shown to create external force on the skull\(^3\).
- Notably, Ahluwalia et al\(^4\) have demonstrated that prevalence of plagiocephaly decreases with age, and most cases are mild in nature.
- Objective: Previously, CVAI (Cranial Vault Asymmetry Index) has been adapted to assess prevalence of plagiocephaly radiographically; however, no CVAI cutoff has been implicated as a clinically significant marker to prompt a diagnosis.

Figure 1. Pediatric skull with plagiocephaly. Littlefield et al\(^1\).
Methods

• A retrospective review was performed on 642 patients in 2018 aged 0 months to 24 months who initially presented with head trauma, and ultimately had a negative non-contrast CT scan.

• A cranial vault asymmetry index (CVAI) was performed for each scan at the level of the superior orbital rim.

• Plagiocephaly status was blinded to the reviewer of the scan.

• The diagnosis of plagiocephaly (CPT Q97.3) was paired to all patient’s and their respective CVAI indices.

• Chi-squared analysis was performed with statistical significance being set a priori p<0.05.
## Results

### Table 1. Demographic information

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<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Mean age (months)</strong></td>
<td>7.53661</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>382 (59%)</td>
</tr>
<tr>
<td>Female</td>
<td>260 (41%)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>411 (64%)</td>
</tr>
<tr>
<td>African American</td>
<td>97 (15%)</td>
</tr>
<tr>
<td>Other</td>
<td>134 (21%)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>167 (26%)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>475 (74%)</td>
</tr>
<tr>
<td><strong>Plagiocephaly cases</strong></td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 3: Proposed CVAI Radiographic Cutoff
• CVAI is inherently imaged-based calculation, and it’s utility is optimized with the use of non-invasive imaging.
• In our study, patients were grouped by CVAI from 2.5% to 12.5% at 1% intervals. All CVAI intervals had statistically significant association in diagnosing plagiocephaly p<0.05.
• However, the strongest association exists at a CVAI of 5.5% $X_2(1, N=642) = 76.2$, $p <0.05$.
• Of patients diagnosed with plagiocephaly, 90% had a CVAI of 5.5% or greater. Thus, this represents the optimal CVAI to filter and diagnose plagiocephaly clinically.
• As such, it is important to note that this radiographic marker must be correlated with a clinical diagnose. There is a variety of cranial and skull asymmetry defects which can be confounding factors in the pediatric population.
• Future direction: Non-contract CT scans will need to be replaced by low-radiation scans to implement the use of CVAI.
Conclusion

• Bottom line: CVAI is a clinically useful tool for measuring the radiographic presence of plagiocephaly; CVAI over 5.5% should prompt a clinical diagnosis.

• This single-center pilot study will need to be validated through a Multi-Institutional effort.

• CVAI needs to be adapted for low-radiation scans. This would maximize clinical utility.
References


Conclusion/Future Directions

• PPP is a prevalent condition in the pediatric population
• Overall decline is expected
• Future directions:
  – Clinical correlation of CVAI
  – Brachycephaly
  – Understanding disparities in treatment and diagnosis