

# Socioeconomic Status and Injury Severity Predicts Follow up for Pediatric Non-Operative Skull Fractures

Weston Northam, MD<sup>1</sup>, Avinash Chandran, PhD<sup>2</sup>, Carolyn Quinsey, MD<sup>1</sup>, Andrew Abumoussa, MD<sup>1</sup>, Alexander Flores BS<sup>3</sup>, Scott Elton, MD<sup>1</sup>

<sup>1</sup>Dept of Neurosurgery, University of North Carolina, Chapel Hill, NC, USA

<sup>2</sup>Matthew Gfeller Sport-Related TBI Research Center, Dept of Exercise and Sport Science, University of North Carolina, Chapel Hill, NC, USA

<sup>3</sup>School of Medicine, University of North Carolina, Chapel Hill, NC, USA

## Introduction

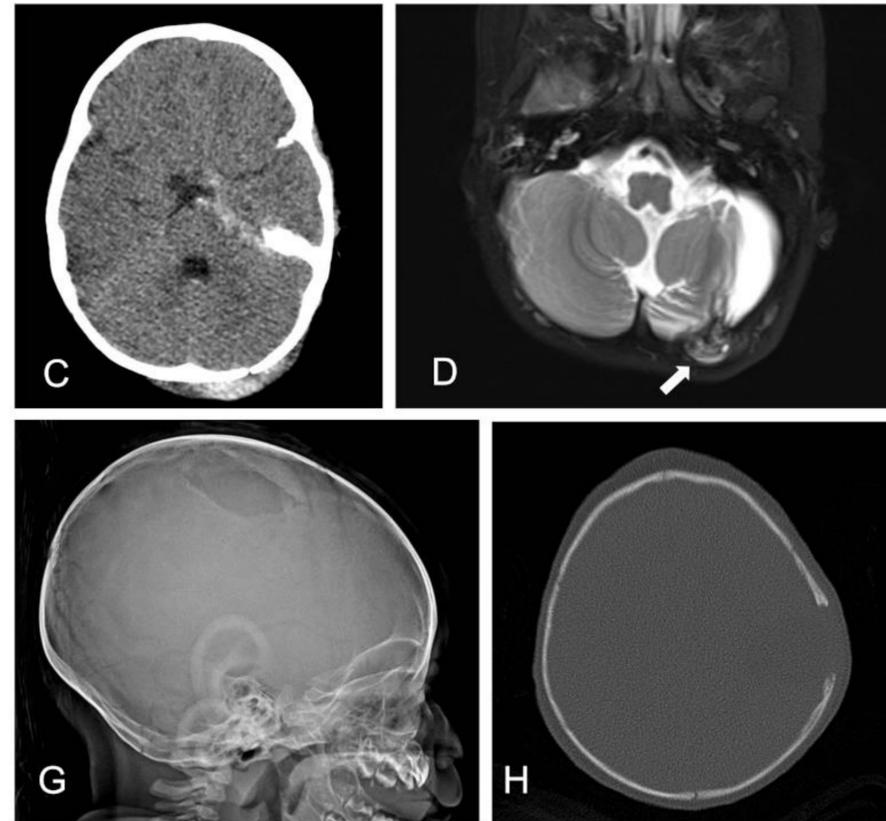
- TBI in 0-14 year olds accounts for over 400,000 annual ED visits in the United States, often with neurosurgical consultation, but only a small minority of these patients with intracranial injury will necessitate surgical intervention.<sup>30</sup>
- Most pediatric skull fracture research focuses on detecting fracture-related complications and neurological decline in the inpatient setting;<sup>13,14,21</sup> however, we currently lack data on longitudinal follow up.
- Gathering longitudinal data on non-operative pediatric skull fracture patients can be a potential cost and resource-saving measure, and could help reduce unnecessary radiation exposure
- Institutions and patients would benefit from evidence-based decision-making on the utility of skull fracture follow up visits and imaging

- To review the outpatient follow up of non-operative skull fractures at a large academic medical center, and determine the utility of these visits and imaging studies
- To profile complications detected during these visits, and describe factors influencing provider decision-making in this population

## Methods

- Retrospective review of the medical record of all patients less than 18 years of age, diagnosed with skull fracture between 2007 and 2017 in the emergency department and seen by neurosurgery
- 414 patients included in the study after fractures requiring operative repair (n=81), or only involving the face (n=325) were excluded
- Demographic data recorded, as well as PCP/insurance status, hospital LOS, GCS on arrival, neurologic deficit, injury mechanism, and associated polytraumatic injuries.
- Cranial imaging was reviewed including fracture location, type, and intracranial hemorrhage
- Follow up visits, and imaging studies performed in neurosurgery clinic were recorded, in addition to any complications that arose during the follow-up period. Chi-squared tests and multi-variable logistic regression were applied.

## Results



Two patients with growing skull fractures are shown. The first patient (C,D) had a left occipital fracture with underlying subdural and subarachnoid hemorrhage, and MRI 6 weeks after injury (D) showed herniation of cerebellar contents through the growing defect. The second patient (G, H) had a left sided parietal fracture which gradually enlarged on Xray at 8 weeks, 16 weeks (G), and CT at 18 weeks (H).

- Demographics: 62.8% male, mean age 5.2 yrs. Majority (62.8%) had PCP, and similar distribution of insured (206) versus non-insured (208) patients.
- Most patients presented after fall (48.1%) and no polytraumatic injuries (68.1%). Most common fracture location was isolated parietal (34.4%). Intracranial hemorrhage seen on 48.1% of initial CT head.
- Over 438 clinic visits and median follow-up of 8 weeks, 231 imaging studies performed, most with CT (n=127, 55%). Only 12 delayed complications detected as outpatient, most commonly growing skull fracture.

Table 1. Delayed Complications

Complications	n	Avg diagnosis time (d)	Avg Age (y)	Intracranial hemorrhage on CT head
Growing fracture	7	66.1	0.7	Yes
Hearing loss	3	48.7	12.2	No
Traumatic Encephalocele	2	80.5	9.0	Yes

## Results (continued)

Table 2. Effect of Socioeconomic Status and Injury Severity

	Recom. Follow-up (%)	p-value	Imaging (%) <sup>b</sup>	p-value
<b>Insurance</b>		<b>&lt;0.01</b>		<b>&lt;0.01</b>
-Yes	174 (84.5)		120 (58.3)	
-No	109 (52.4)		46 (22.1)	
<b>Primary Care Physician</b>		<b>&lt;0.01</b>		<b>&lt;0.01</b>
-Yes	218 (83.2)		144 (55.0)	
-No	65 (42.8)		22 (14.5)	
<b>Neurological deficit</b>		<b>0.02</b>		0.51
-Yes	52 (58.4)		33 (37.1)	
-No	231 (71.1)		133 (40.9)	
<b>Hemorrhage</b>		<b>0.03</b>		<b>&lt;0.01</b>
-None	133 (65.5)		72 (35.5)	
-One	136 (69.0)		83 (42.1)	
-Multiple	14 (100.0)		11 (78.6)	
<b>Pneumocephalus</b>		<b>0.02</b>		0.33
-Yes	29 (54.7)		18 (34.0)	
-No	254 (70.4)		148 (41.0)	
<b>Bilateral fracture</b>		<b>0.03</b>		<b>&lt;0.01</b>
-Yes	26 (86.7)		19 (63.3)	
-No	257 (66.9)		147 (38.3)	

## Discussion / Conclusions

- Pediatric non-operative skull fractures drive a large expenditure of clinic and imaging resources to detect a relatively small profile of complications.
- Recommendation of follow-up was associated with insurance, neurologic deficit, intracranial hemorrhage, pneumocephalus, and bilateral fracture. Outpatient imaging was associated with insurance, PCP, intracranial hemorrhage, and bilateral fracture.
- No complications were found in patients with linear fractures above the skull base without intracranial hemorrhage.
- Limitations: this is a single-center, retrospective study. Due to the nature of our institution as a referral center, some patients may have followed up at a more local institution due to travel distance.

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