Rethinking Radiology: The Limited Value of Head CT Scans in Pediatric Seizure Diagnosis and Treatment

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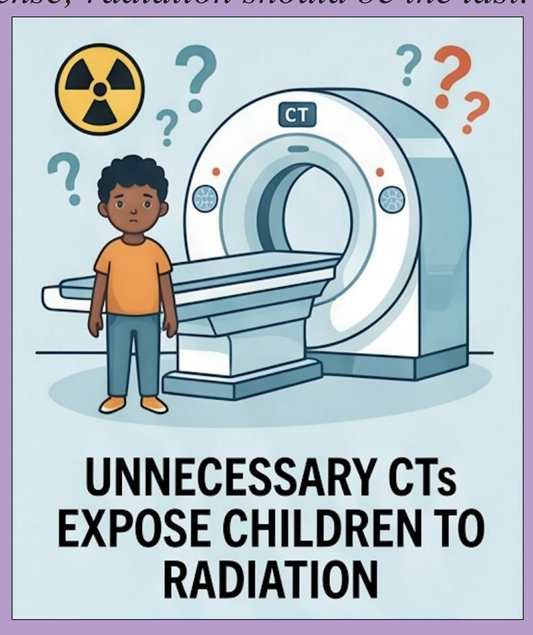
Introduction

The Problem

Head Computed Tomography (CT) scans are frequently used in Emergency Departments to evaluate pediatric seizures. However, this "reflexive" imaging comes at a cost:

- **Radiation Risk:** Exposes developing brains to potentially harmful ionizing radiation.
- **Low Yield:** Scans rarely provide findings that change acute management.
- **Parental Pressure:** Use is often driven by a desire for parental reassurance rather than clinical necessity.

"Clinical evaluation is the first line of defense; radiation should be the last."



Methods

Retrospective chart review was conducted on 54 pediatric patients, aged one to 17 years, who presented with unprovoked seizure or seizure-like activity at Our Lady of the Lake Children's Hospital in Louisiana and underwent a head CT scan.

- The data points collected and analyzed included patient demographics, seizure characteristics such as focality, duration, and febrile status, as well as neurological exam results and family history.
- Inclusion criteria consisted of patients who underwent an emergent head CT.
- To focus on standard seizure management, exclusion criteria were applied to high-risk cases; specifically, patients with known hydrocephalus, VP shunts, macrocephaly, encephalitis, or witnessed head injuries were excluded from the study.

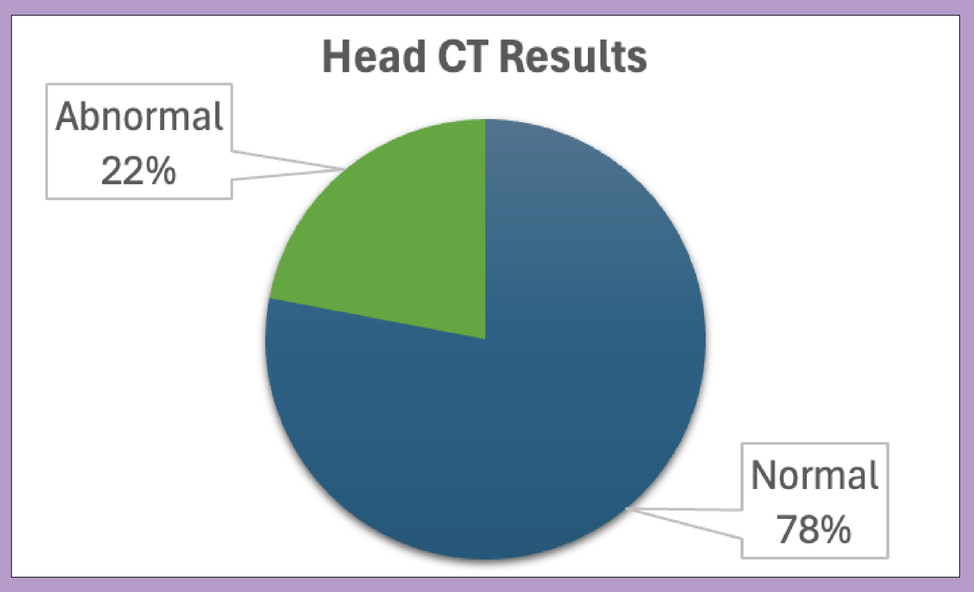


Figure 1: Normal (n=42) and abnormal (n=12) head CT scan data elicited from findings in radiology reports of pediatric patients presenting to OLOL Children's Hospital with seizures.

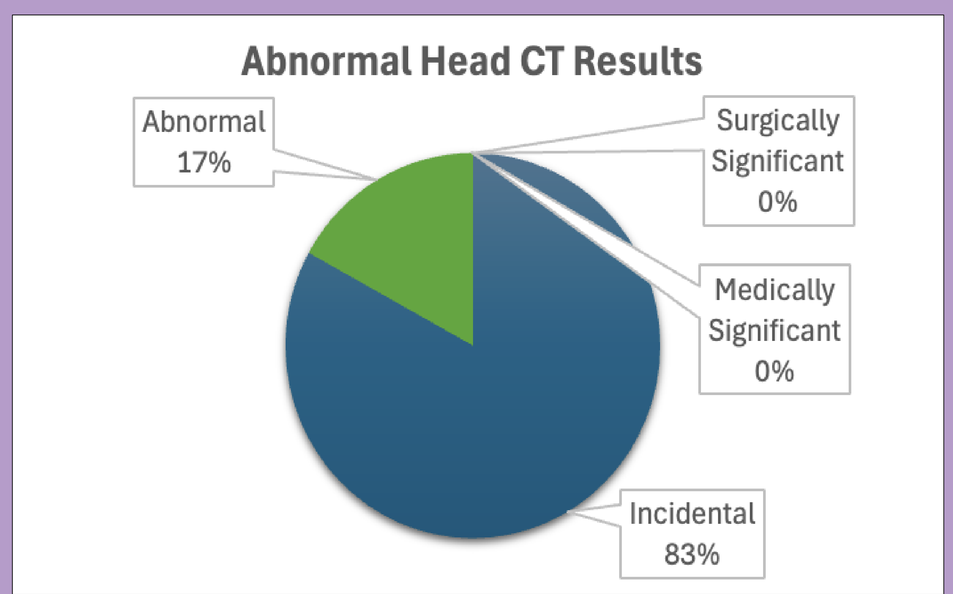


Figure 2: Abnormal head CT scans subdivided into three categories:

Incidental (n=10): indicated medical diagnosis unrelated to seizure

Abnormal, other (n=2): other medical conditions present but did not impact immediate seizure treatment

Medically or Surgically Significant (n=0): altered treatment plan

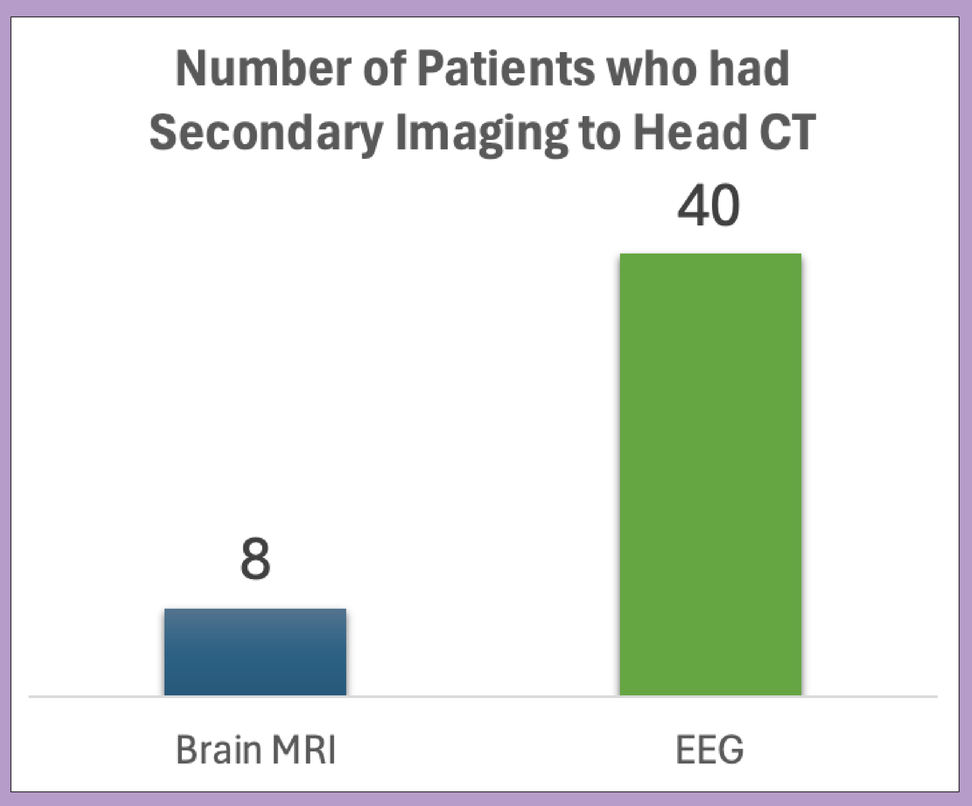


Figure 3: Number of patients who had a Brain MRI (n=8) or an EEG (n=40) conducted with the Head CT

Results

If a child had a head CT that was considered abnormal, none were medically or surgically significant in the context of seizure or emergency department management:

Head CT Efficacy:

- **Normal Results**: 78% (n=42) of cases reviewed showed no abnormalities.
- **Abnormal Results**: 22% (n=12) of scans were flagged as abnormal.
- **The Critical Gap**: **None** of the abnormal findings were deemed medically or surgically significant for emergency management

Finding Category	Frequency	Impact on Acute Treatment
Incidental	83% (n=10)	None; primarily ENT issues (e.g., sinus/ear) requiring outpatient follow-up.
Abnormal, Other	17% (n=2)	None; included conditions like cerebral atrophy or anoxic injury that did not alter ED care.
Surgically Significant	**0%** (n=0)	**Zero changes** to surgical or immediate medical intervention plans.

Of the 54 patients, 15% (n=8) had a brain MRI conducted, while 74% (n=40) had an EEG conducted. No changes in management were made secondary to the MRI, but in 12 cases, direct changes to medical management were made secondary to the EEG.

Discussion

The study demonstrates that routine head CT scans rarely impact the management of pediatric seizure patients.

- **Quality Over Quantity**: Given the low yield and radiation risks, routine use should be reconsidered in favor of evidence-based decisions.
- **Communication Strategy**: There is a critical need to educate parents on the risks of unnecessary radiation and the higher diagnostic value of non-emergent tests like EEG.
- **Cost and Safety**: Reducing unwarranted CTs enhances patient care, lowers costs, and prevents the "overdiagnosis" of incidental findings.

SCAN SMART, NOT FAST!