



The role of computed tomography in following up pediatric skull fractures

Maria Zulfiqar, M.D.^a, Stacy Kim, M.D.^a, Jin-Ping Lai, M.D.^b,
Yihua Zhou, M.D., Ph.D.^{a,*}

^aDepartment of Radiology, Saint Louis University School of Medicine, St. Louis, MO, USA;

^bDepartment of Pathology, Saint Louis University School of Medicine, St. Louis, MO, USA

KEYWORDS:

Calvarial fracture;
Management;
Children;
Imaging follow-up

Abstract

BACKGROUND: Despite the added radiation exposure and costs, the role of computed tomography (CT) in following pediatric skull fractures has not been fully evaluated.

METHODS: We reviewed the radiology reports and images of the initial and follow-up head CT examinations of children with skull fractures to determine whether any interval changes in the fracture morphology and associated complications necessitate a change in clinical management.

RESULTS: A total of 316 pediatric cases of skull fractures were identified, including 172 patients with and 144 without follow-up scans. At follow-up, 7% of skull fractures were unchanged, 65% healing, and 28% healed. No patient showed findings to cause a change in clinical management or a need for further medical or surgical intervention regardless of the number and patterns of the fractures or the initial intracranial complications such as intracranial hemorrhage, pneumocephalus, and traumatic brain injuries.

CONCLUSIONS: Head CT may be unnecessary in following pediatric skull fractures in asymptomatic patients to avoid added radiation exposure and cost.

© 2016 Elsevier Inc. All rights reserved.

Skull fractures are commonly seen in the pediatric population as a result of direct impact to the calvarium and are significant because of their association with intracranial injury, which is considered the leading cause of traumatic death and disability in childhood.¹ The initial management of skull fractures is chiefly governed by the presence of associated brain injury as well as the nature of

the fractures. Head computed tomography (CT) has evolved as the diagnostic method of choice for the identification of skull fractures along with associated intracranial injury in patients with head trauma.² However, clinical evidence is relatively lacking in the literature concerning follow-up imaging of skull fractures in the pediatric population in the absence of signs and symptoms such as headache, vision change, wound infection, or change in physical appearance of the fracture site. Based on anecdotal observation at our children's hospital, many pediatric patients are followed with head CT examinations for their skull fractures which may not be needed, particularly in light of radiation exposure to the patients and added medical costs. Children are at the greatest risk of developing cancer due to medical imaging for their rapidly dividing, relatively undeveloped cells that

There were no relevant financial relationships or any sources of support in the form of grants, equipment, or drugs.

The authors declare no conflicts of interest.

* Corresponding author. Tel.: +1 314-268-5782; fax: +1 314-268-5116.

E-mail address: yzhou31@slu.edu

Manuscript received March 29, 2016; revised manuscript June 7, 2016

are not able to repair the mutations caused by radiation exposure and for their long life expectancy.³⁻⁵

In radiological evaluation, it is important to describe the morphology and location of the fracture as these may be related to the prognosis and the degree of accompanied intracranial injuries.⁶ Most clinical classifications of skull fractures are based on some variation in the following categories: simple, complex, comminuted or composite, depressed, basilar, stellate, diastatic, growing, and ping-pong.⁷ The parietal bone is involved most frequently, followed by the occipital, frontal, and temporal bones.⁸ Anthropological analysis by Wiersema et al⁷ provides a useful scheme for describing pediatric skull fractures by using (1) category, which divides the fractures into being simple, complex, or comminuted; (2) pattern, of being linear, curvilinear, stellate, or diastatic; and (3) descriptors to delineate the fracture as being depressed or displaced and to account for the degree of healing. However, it is not clear whether the morphology of the skull fractures plays a role in deciding whether follow-up imaging is required.

Several recent publications have proposed recommendations concerning initial and early management of isolated skull fractures (ISFs) in the pediatric population. Blackwood et al⁹ showed that pediatric ISFs are low-risk conditions with a low likelihood of complications, and these patients can be discharged safely from the emergency department (ED) without inpatient observation. Rollins et al¹⁰ also concluded that children with a presenting Glasgow coma score of 15 and an ISF can be safely discharged from the ED after a short period of observation if they are asymptomatic and have a reliable social environment. A recent retrospective study demonstrated that pediatric ISF did not necessitate a repeat head CT as long as they do not develop worsening clinical indicators of head injury.¹¹ This study excluded patients with multisystem trauma and identification of intracranial hemorrhage (ICH) on initial imaging of the brain, with only 65 subjects in the final analysis. Of the 65 patients, 1 (1.5%) developed ICH on follow-up CT examination. However, these studies did not directly address the roles of head CT in following up pediatric skull fractures weeks or months after the acute stage of injury, a practice that is being used not uncommonly. In addition, these studies focused on the ISFs with several exclusion criteria (for example, excluding the “displaced” or “depressed” fractures¹⁰) and without addressing those with accompanying ICH, brain injury, pneumocephalus, and surgical repairs. In this retrospective study, we examine the role of head CT in following up skull fractures including both isolated ones and those complicated with intracranial injuries by evaluating the radiological findings and outcomes in pediatric patients.

Methods

The institutional review board approved the study as having been compliant with Health Insurance Portability

and Accountability Act statutes for expedited review of retrospective imaging studies and did not require patient informed consent.

Patients between 0 to 18 years of age presented in our pediatric hospital during June 2013 to June 2015 were included in this study. We reviewed the radiology reports of standard clinical noncontrast head CT examinations to identify pediatric patients with skull fractures. Patients who had at least 2 head CT scans that were at least 2 weeks apart (an arbitrary cutoff interval partially based on the referring patterns of the providers) are counted as having follow-up head CT studies, whereas the rest as without follow-up. The CT scans were performed on any of the 2 identical multidetector clinical CT scanners using a tube voltage (kVp) of 100 kV for patients younger than 6 years or 120 kV for kids older than 6, and tube currents of 100 mA for patients between 0 and 6 months or between 6 years and 12 years and 180 mA for kids between 6 months and 6 years or older than 12 years. The pitch for all patients was .531 mm, and the fields of view were generally between 15 and 25 cm depending on the size of the patient. The bone images of the skull were reconstructed using a bone kernel and 2.5-mm slice thickness. For subjects younger than 2 years of age, 3-dimensional surface rendering of the skull was also used.

Patients with initial head CT demonstrating skull fractures involving the frontal, parietal, occipital, and temporal bones were included, whereas those with fractures involving the skull base and maxillofacial bones were excluded as the later ones are usually more complicated and may deserve a different approach. The types, patterns, and descriptions of the skull fractures were recorded according to scheme provided by Wiersema et al.⁷ The number of fractured bones along and the associated findings of ICH, brain injury (such as contusion and diffuse axonal injury), or pneumocephalus were also recorded. Reports of the follow-up head CT scans were reviewed to determine the presence of any change in the fracture since the initial CT scan. The types of follow-up findings included unchanged, healing, healed, surgically repaired, worse alignment, widened fracture line, and other unusual findings. If there was more than one follow-up study, the information was taken from the last available examination. Subsequently, the images of the initial and follow-up head CT scans were reviewed to confirm the findings. Any discrepancy between the reports and the imaging review was corrected based on the review of the images. The chi-square test is used to compare the rate of intracranial findings in patients without and with follow-up CT scans.

Results

There were 316 pediatric patients with skull fractures during the 2 years of study period, including 172 cases (110 males, 62 females) that had an initial head CT scan and at least 1 follow-up scan more than 14 days after the initial

Download English Version:

<https://daneshyari.com/en/article/5730982>

Download Persian Version:

<https://daneshyari.com/article/5730982>

[Daneshyari.com](https://daneshyari.com)