Reducing Radiation in the Evaluation of Child Abuse

Kaaren Shebesta, MSN, APRN, Suzanne Moody, MPA, Rebecca Cook, DNP, APRN, Erin Butt, MSN, APRN, Robert Shapiro, MD,

Kathi Makoroff, MD, Med, Marguerite M. Caré, MD and Richard A. Falcone, Jr., MD, MPH

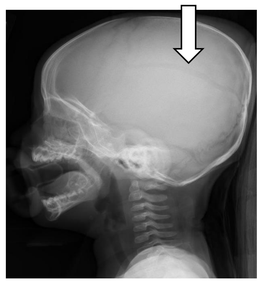
Cincinnati Children's

Introduction

- Child abuse is a leading cause of injury and death of children in the United States. In 2012, there were 686,000 victims of abuse and neglect, 18.3% of children were physically abused and 1,640 died due to abuse and neglect. Abusive head trauma is the most common cause of death due to child abuse.
- Screening and identification of children who may be the victims of non-accidental trauma is essential in order to avoid serious future injuries and keep children safe. One of the common tools of screening is the skeletal survey, multiple radiographs to identify occult fractures. Skeletal screening has proven to be an effective clinical indicator of child physical abuse when abuse is suspected or accidental injury is unlikely. The AAP recommends the skeletal survey in all cases of suspected physical abuse in children younger than 2 years. The American Academy of Radiology guidelines specifies 21 images that are to be included in a skeletal survey.
- Radiation exposure in infants and young children in the form of radiographs and computerized tomography (CT), however, has been linked to a potential increased risk of cancer.

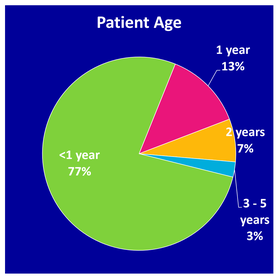
Aim

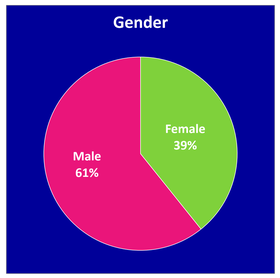
Decreasing unnecessary radiation exposure in patients undergoing a skeletal survey could be achieved by eliminating duplicate studies without missing any potential injuries. The aim of this study was therefore to determine if obtaining skull radiographs as part of the skeletal survey in children undergoing a head CT contributes to the diagnostic evaluation.

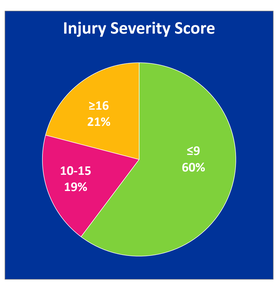


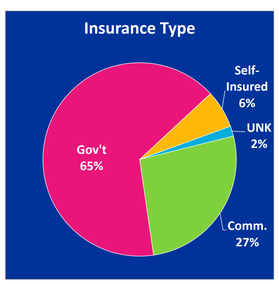
Method

Our center is a Level I Pediatric Trauma Center that admits approximately 600 trauma patients per year to the trauma service. A retrospective chart review was performed on 474 children ranging in age from 4 days to 65 months with a median age of 8.6 months from January 1, 2009 to December 31, 2013. Patients were included if they were treated for a head injury and had a head CT and skeletal survey performed.

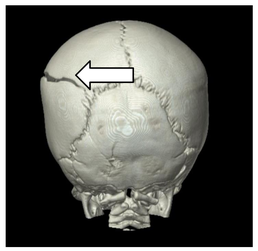


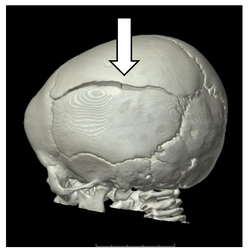


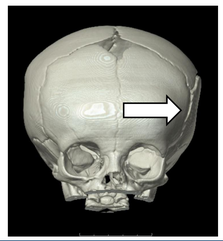




In addition, at our institution, multiplanar reformats with coronal, sagittal and 3D reconstructions are made on all children less than the age of 2 with suspected trauma.

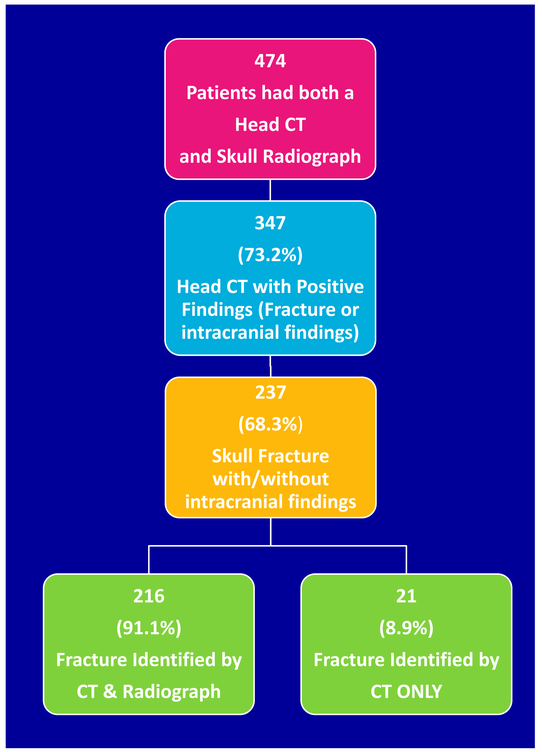


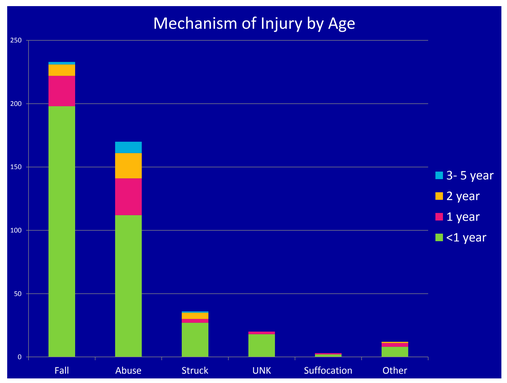




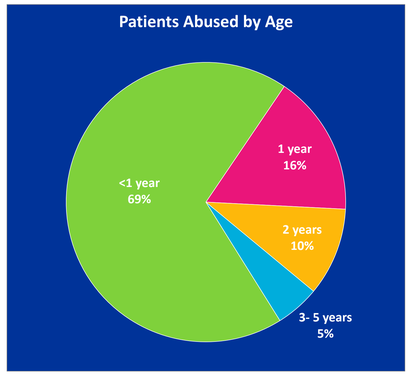
Results

Head CT was able to identify a total of 347 (73%) patients with a skull fracture and/or intracranial hemorrhage. Of the 237 children that had a fracture identified on head CT, 21 (9%) of these fractures were not identified on radiographs. Of the 237 children who had a fracture identified, 0% were identified by skull radiograph only.





Results – cont.



Conclusion

When treating infants and young children with head injuries, it is vital to identify other injuries consistent with maltreatment. With the advancement in CT technology, skull radiographs can be eliminated in the skeletal survey when a head CT is indicated or has already been performed without the risk of missing incidental skull fractures. By eliminating unnecessary skull radiographs, we can safely decrease the amount of radiation exposure while continuing to accurately identify head injuries.

Future Studies

Infants and young children often receive other diagnostic imaging when abuse or maltreatment is suspected. With the advancement in CT technology, other radiographs from the skeletal survey could potentially be eliminated on specific patients. For example, in the child where an abdominal/pelvic CT is done to assess for abdominal trauma, lumbar spine and pelvic radiographs may not be needed. Additional research is needed to determine if excluding these radiographs has any effect on identifying injuries.

Limitations

3D reconstructions are needed due to the fact that axial oriented fractures could still be missed on a standard CT. Many institutions may not yet have the capability of 3D reconstructions.

Acknowledgements

Trauma Services, Division of Pediatric General and Thoracic Surgery, Mayerson Center for Safe & Healthy Children, and the Department of Radiology