

# Detecting Child Abuse

## Introduction

In the US, a child abuse report is filed every ten seconds.

That is more than 3.6 million reports filed every year and, because a report can involve more than one child, that is well over 6.6 million children affected by child abuse (Childhelp, 2018). The terms “bucket handle fracture”, “nursemaid’s elbow” and “corner fracture” are synonymous to the classic metaphyseal lesion (CML). Today, CML’s are strong radiological indicators of child abuse (Johnson, 2017). The presence of a CML alone cannot prove child abuse, however the presence of a CML should prompt further investigation to additional traumatic injuries. In addition to the presence of a CML, the posterior rib fracture is another well known injury indicative of child abuse. Posterior rib fractures hold a 95% positive predictive value for physical abuse in children below the age of three (Freemont, Konala, & Raynor, 2018).

## Methods of Imaging

Skeletal surveys consisting of anteroposterior (AP) and lateral skull images, AP chest including the clavicles as well as oblique images of the chest to view ribs, AP abdomen, lateral spine and AP images of the upper arms, forearms, femurs, and lower legs as well as posteroanterior (PA) of both hands and a dorsoposterior (DP) of both feet are the standard method of imaging for suspected non accidental trauma under the age of two (Offiah, Paddock, & Sprigg, 2016). Additional images may need to be obtained to better visualize pertinent anatomy, such as the metaphysis of long bones or to better visualize an injury.

## References

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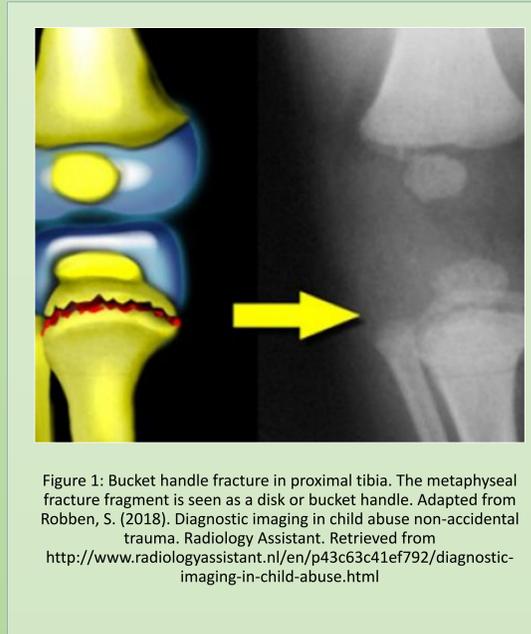


Figure 1: Bucket handle fracture in proximal tibia. The metaphyseal fracture fragment is seen as a disk or bucket handle. Adapted from Robben, S. (2018). Diagnostic imaging in child abuse non-accidental trauma. Radiology Assistant. Retrieved from <http://www.radiologyassistant.nl/en/p43c63c41ef792/diagnostic-imaging-in-child-abuse.html>



Figure 2: Typical corner fracture very specific for non-accidental trauma. Adapted from Robben, S. (2018). Diagnostic imaging in child abuse non-accidental trauma. Radiology Assistant. Retrieved from <http://www.radiologyassistant.nl/en/p43c63c41ef792/diagnostic-imaging-in-child-abuse.html>

## Results

Other imaging modalities such as CT, ultrasound, MRI, or radionuclide imaging can be utilized to better visualize anatomy for more specified indications however, a skeletal survey continues to be the standard method of imaging (Offiah, Paddock, & Sprigg, 2016).

**CT** can be more sensitive in the identification of rib fractures when compared to traditional radiography. However, this modality of radiography increases dose and should be used sparingly.

**Ultrasound** can be used to diagnose the presence of subperiosteal fluid, metaphyseal and rib fractures (Clinical Radiology: The Royal College of Radiologists, 2017).

**MRI** offers an increased sensitivity to soft tissues and can be helpful in detecting soft tissue injuries. MRI also does not utilize ionizing radiation; therefore, it does not irradiate the child. This modality of radiology can be helpful in specified cases. Currently, whole body MRI is not shown to be of routine value (Clinical Radiology: The Royal College of Radiologists, 2017). A study was done to compare MRI to a skeletal survey; 16 infants were examined. The MRI was only able to identify 5.4% of the CML’s, versus the skeletal survey’s 64.8%. The MRI exam further only identified 54% of the rib fractures in the 16 infants (Freemont et al., 2018).

## Conclusion

Various forms of imaging can be utilized to aid in the diagnosis of child abuse, but the skeletal survey consisting of nearly 20 images is considered common practice. Some debate does occur concerning the dose to the child and questions if the additional forensic benefit outweighs the radiation exposure to the child. MRI is not often a substitute to the skeletal survey as it is less affective in diagnosing CML’s as well as rib fractures. CT scans can be quite effective; however, they increase dose to the child when compared to the skeletal survey. From the research that has been done, more extensive testing should be done to evaluate the effectiveness of other modalities when diagnosing child abuse. There should be further investigation to minimize dose to the patient while still providing an optimal diagnosis.