Maine Medical Center
Department of Emergency Medicine
Journal Club Summary

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Article Citation:
Harper et al- Additional Injuries in Young Infants with Concern for Abuse and Apparently Isolated Bruises. The Journal of Pediatrics 2014; 165: 383-8.

Country:
United States

Funding Source(s):

☒ None Stated

Purpose

Study Purpose:
Their objective was to determine the rate at which diagnostic testing for occult injury is performed in infants presenting with apparently isolated bruising AND to determine the prevalence of additional serious injuries and bleeding disorders in a large population of infants <6 months of age who underwent subspecialty evaluation.

Hypotheses:
none stated

Methods

Study Design:
The primary study was a prospective, observational, cross-sectional study of children <10 years old evaluated for possible physical abuse by 20 child abuse teams. This current study was a prospectively planned secondary analysis of a certain cohort of subjects from this original data.

Outcome(s) *[or Dependent Variable]:*
Rate of diagnostic testing
Prevalence of additional serious injuries or bleeding disorders diagnosed

Intervention *[or Independent Variable]:*
NA

Ethics Review: all participating centers obtained approval from their IRB

Research Setting:
20 different child abuse teams throughout the United States

Study Subjects:
Index subjects from the ExSTRA study who were younger than 6 months old and who were coded as having bruises were eligible for the study. Eligible subjects were selected for further analysis to identify those who presented for care because of apparently isolated bruising.

Inclusion Criteria:
As above, subjects presenting with apparently isolated bruising who were <6 months old.
Patients with history of fall were not excluded because often this history was provided in cases of both accidental trauma and abuse.

Exclusion Criteria:
Subjects were not considered to have apparently isolated bruising if there were other concerning physical examination findings unrelated to bruises (AMS, decreased limb use, oral bleeding) or a history of assault.

Study Interventions:
NA

Study Groups:
NA

Instruments/Measures Used:
For enrolled subjects in the ExSTRA study a child abuse physician (CAP) recorded three variables: 1) characteristics of an identified cutaneous injury, 2) the results of any diagnostic testing, and 3) the ultimate estimate of the likelihood of abuse at the time of disposition on a scale from 1-7 where 7 meant "Definite inflicted injury" and 1 mean "Definitely not inflicted injury"

For this study, to determine whether a subject presented for apparently isolated bruising, 3 independent reviewers who were blinded to the results of the diagnostic testing reviewed data from the history and physical examinations of all eligible subjects. Disagreement on inclusion or exclusion of subjects was resolved on consensus.

Data Collection:
Data were entered prospectively during the parent study into a secure, web-based data entry form.
Child abuse physicians (CAPs) recorded the presence of cutaneous injuries and whether testing (if done) identified a new injury, known injury, mimic, or was normal. Identified injuries were defined as "new injuries" if they had not been demonstrated on previous study, including physical examination.

Data Analysis:

***A priori* sample size calculation?** ☐ Yes ☐ No ☒ Not Described ☐ N/A

Statistical analyses used:
Descriptive statistics were used to describe the proportion of subjects with diagnostic testing performed, and the proportion of these tests that identified additional serious injuries or bleeding disorders
Fleiss kappa was used to determine initial inter-rater agreement between the three raters who determined the presence of apparently isolated bruising.

Adjustment for potential confounders? ☐ Yes ☐ No ☒ Not Described ☐ N/A
If yes, list:

Results
Study participants: Total number of subjects was 146 There were 2890 index children abstracted form the ExSTRA research network 33.9% (980/2890) were <6 months old 25.9% (254/980) had bruising 57.5% (146/254) of these had apparently isolated bruising
Brief answers to research questions*:* They found that in this cohort of patients with apparently isolated bruising there was an increase in the rates of diagnostic testing performed for occult injury when compared to the overall parent cohort of subjects. - 93.8% underwent a skeletal survey whereas in the parent cohort only 70.9% underwent screening. -91.1% underwent neuroimaging in the study cohort versus only 58.5% in the parent cohort. -There was only a slight increase in the testing of hepatic transaminases (63% vs 53.2%) and abdominal CT imaging (10.3% vs 10.1%). -Diagnostic testing for bleeding disorders was completed in 70.5% (103/146) of subjects. Testing was much more likely to be ordered for subjects with 2+ bruises. For the majority of patients only PT/PTT were obtained, platelets were reported in 89 subjects. Only 20% of subjects had any additional bleeding disorder testing ordered. Their second aim was to determine the prevalence of additional injuries in this cohort of patients. Overall, 50% (73/146) of all subjects had additional injuries identified by diagnostic testing. 50% had a high perceived likelihood of abuse. 43 had both a high perceived likelihood of abuse and additional injury identified. There was no significant association between the number or location of bruises and the presence of additional serious injuries. Even among infants with a single bruise, 60% were found to have additional injuries. Of those who underwent a skeletal survey (93.8%) 23.3% (34/146) of them were found to have new fractures. Multiple fractures were identified in 36/62 of these patients (58%). Of those who underwent neuroimaging, 27.4% (40/133) had a new injury identified. New abdominal injury was identified in only 2.7% (4/146) subjects. All four injuries were liver lacerations and/or contusions. Bleeding disorder testing was normal in 76.7% of subjects and nonspecific in 22.3%. Ultimately, no bleeding disorders were identified.
Additional findings: They additionally found that among subjects with neuroimaging, 90% had face or head bruising and that subjects with face or head bruising were significantly more likely to have a new injury identified by neuroimaging than those with bruising elsewhere. Skull fractures were identified in 28 subjects, of whom only 10 had isolated scalp swelling without additional bruising on PE. Only 7 subjects with skull fractures had a history of trauma. The remaining subjects with skull fractures had multiple bruises (8), multiple fractures (7), and an abdominal injury (1). No infant in this cohort had a single fracture identified by isolated bruising overlying the site of injury.

Limitations:

Selection bias- the cohort includes only infants who were referred for subspecialty evaluation with physical abuse concerns. It is likely that a lot of subjects were evaluated and may not have been referred despite there being presence of bruising.

Observational study- diagnostic testing and evaluation varied between centers and child abuse physicians.

Likely physician gestalt played a role somewhat in medical decision making which is difficult to control for. It is further possible that some subjects may have had bruises that were not accounted for and ultimately may have been inappropriately excluded from the study cohort. Additionally, they were determining the presence of an apparently isolated bruise based on documentation of the physical exam, which may not be accurate.

Testing for bleeding disorders was limited- studies now suggest that obtaining a CBC, PT/PTT, Factor 8 and 9, and testing for von Willebrand disease. The majority of the patients that were tested only had PT/PTT and maybe platelets.

Clinical Implications

Applicable?
Absolutely. This study helps to confirm that any infant <6mos of age, regardless of the number of bruises, should undergo a full child abuse evaluation as there is a very high likelihood that there are additional injuries present. This is a particular subset of patients that we should be more wary about if there is any sign of trauma as they clearly have a high percentage of injuries that are unable to be detected on the physical exam alone.
It is applicable here at MMC where we have access to child abuse specialists, but may be more difficult in the community. Still helps to provide the framework for the initial diagnostic evaluation of patients that you are concerned about.

Feasible?
Certainly feasible- not difficult to obtain skeletal surveys, lab studies, or neuroimaging, especially if the concern is present. More radiation exposure here at MMC since we do not have rapid MRI capabilities, but the risk is worth the benefit.

Clinically relevant?
Yes

Comments:
Ultimately their hope was to begin to create a streamlined, evidence based approach when evaluating infants with initial physical exam findings indicative of abuse as to prevent any race or socioeconomic bias as well as increase diagnosis of medical conditions that mimic abuse.

As providers we need to be hypervigilant and always consider non-accidental trauma in infants who are non-mobile and present with any signs of bruising or trauma. The researchers ultimately concluded that

routine medical evaluation for young infants with bruises and concern for physical abuse should include physical examination, skeletal survey, neuroimaging, and abdominal injury screening.
Level of evidence generated from this study
☒III: evidence obtained from a well-designed, non-experimental, observational study

Additional Comments/Discussion/Notes