The Medical Assessment of Bruising in Suspected Child Maltreatment Cases

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Introduction

Hi there, PedsCases listeners, I'm Josie Cipolla, third year medical student at McGill University. This podcast was made possible by the amazing students and pediatricians behind the PedsCases.com website and the Canadian Pediatric Society, or CPS.
Today we're going to talk about how to assess bruising in babies and children, and the possible causes for this, including the sensitive issue of potential child maltreatment. If you're thinking that this is a rare clinical presentation meant to be dealt with by senior staff – think again. This is a really common problem and you will unfortunately see it in your training and practice at some point, as early on as during medical school, and medical students can have an important role to play in the care of a child who is suspected to be experiencing maltreatment.
The information covered in this podcast is based on the updated CPS position statement available on the CPS website, in case you want to read more or review anything we'll talk about today.

Objectives

The objectives that will be covered in this podcast include:
1. Develop an approach to the assessment of bruising in infants and children
2. Review the differential diagnosis for bruising in infants and children
3. Identify concerning features that should alert clinicians to the possibility of inflicted trauma
4. List key investigations to reveal the etiology of bruising/bleeding and any potential occult injuries
5. Utilize the pneumonic ICE to help relay information to team members and child welfare authorities
6. Recognize a health professionals obligation to report injuries concerning for child abuse to the appropriate child welfare authority.

I hope it will also make you feel more comfortable in having a structured approach to considering the large differential for bruising as a healthcare provider, including not missing the potential for inflicted bruising or abuse. You'll notice that in this talk I'll use the term child maltreatment – that's the term that encompasses all forms of abuse and neglect of children.

Since abuse is not a medical diagnosis, it's a conclusion based on putting all the information together from medicine, police work, the courts and the children's aid society/Children Services,

I'll stay away from the word abuse because our job as health providers is critical in recognizing when the history is atypical for the presenting injuries, and not necessarily determining on our own that abuse is the etiology. Often cases involving child maltreatment are not definitive, our role is to consider the history, physical exam, investigations and generate an appropriate differential diagnosis. More simply, as doctors we evaluate injuries and medical conditions, generate differential diagnoses, and embark on a comprehensive diagnostic and management plan, we are NOT investigators. If there is a suspicion of child maltreatment we are required as health professionals to notify Child Welfare authorities to further investigate. The realm of Child Maltreatment is a team endeavor.

Take home points

1. Bruising is the most common finding in child physical maltreatment, and often the most underreported sign
2. Bruising in young kids can be caused by trauma or medical conditions, or a combination of the two.
3. There are red flags that should make you stop and think about inflicted injury as a real possibility:
   - bruises in less common areas like the ears, neck, feet, buttocks or torso; or not on bony prominences
   - unusually large or numerous bruises;
   - bruises occur in patterns or in clusters;
   - bruises that don't fit with the described mechanism or developmental stage: remember, you shouldn't bruise if you don't yet cruise
4. Thinking of the mnemonic ICE can help you to remain cool and calm when communicating your concern for child abuse to your staff and child welfare authorities

So, let's start with a case and walk through what might happen in a real situation.

Case

You are a medical student rotating through a pediatrician's office when Cindy, a 4 –month-old girl comes in with her mother for her well-child visit. You take a history and do a physical exam before reviewing with the pediatrician, Dr. Blue. Cindy's mom tells you Cindy is feeding well and is just staring to roll over, but cries a lot – at least 3 or 4 hours in the evening and sometimes for long stretches during the day too. She'll only sleep 2 or 3 hours at a time. She says that she and her husband are exhausted but really love having a new baby. On exam you notice three, small, round, brown bruises along Cindy's collar bone. When you point them out, her mother says that she had not noticed them before, but offers you the suggestion that she might have secured the seat belt too tightly when fastening her into her car seat.
So at this point, before going on further in the case, let's talk about bruises in general before thinking about what red flags you may have noticed.

Understanding the difference between normal childhood bruising and inflicted bruises

Think of a bruise as bleeding within the subcutaneous tissues. This usually happens when the tissues are injured when a force impacts, crushes or compresses the tissue. It can also happen when the blood vessels get leaky from certain medical condition or when the blood can't clot properly. The most common reasons for bruising in childhood are from accidental causes: in other words, resulting from routine play in a child who has learned to crawl or walk. And this is different from what you would call an inflicted bruise, which is one that results from someone else's actions, not the child's, which should be explored in any child with bruising.

Evaluation of Bruising

Even when evaluating for child maltreatment, you should follow your usual approach of performing a thorough history, completing a full physical exam and ordering appropriate investigations as we would for any other presenting problem.

I find it helpful to think of our differential diagnosis for bruising in kids as Medical and Traumatic causes. Traumatic cases can be further broken down into: birth trauma, medical procedures, or injuries caused by the child themselves or caused by another person. Trauma caused by another person is often referred to as inflicted trauma.

While it is tempting to jump to trauma as the cause in many cases, especially in very young children, it is important to work through the differential of medical causes in a systematic way. If we think of medical conditions, there are disorders of the blood, vessels and tissues. Let's talk about blood first. The most common inherited coagulation disorder is von Willebrand disease where there is an inherited absence or defect of the clotting protein called von Willebrand factor, but because of its subtler presentation, it doesn't usually get diagnosed in young children –there are simply not many instances in which their coagulation system would be stressed to signal a problem at that age. This is why it more often gets detected later in childhood or adulthood with an incidence rate of 1% in the Canadian population. This is followed by type A hemophilia, which is a factor 8 deficiency in the clotting cascade at 0.02% of Canadian baby boys, and type B hemophilia, a factor 9 deficiency in 0.005% of Canadian baby boys.

Presentation of bleeding in von Willebrand disease differs from coagulation factor deficiencies like hemophilia in that von Willebrand typically show up as bleeding in mucous membranes or across skin while hemophilia often presents with deep bleeding in joints, soft tissues, GI tract. Along with these are other rare platelet function disorders and fibrinogen disorders that run in families to consider.

As for the acquired causes of coagulopathies in blood, we think about problems that can cause thrombocytopenia, or low platelets. Immune thrombocytopenic purpura (ITP)is an acquired immune disease that results in platelet destruction or consumption. Other causes of thrombocytopenia include: Infection, drug induction, leukemia and bone marrow failure.

Vitamin K deficiency, which is quite rare here in Canada where all newborn infants receive a dose of vitamin K, is another acquired cause of coagulopathy. Vitamin C deficiency can also present as easy bruising.

Questions we could ask the mother in our case, is whether there has ever been a history of prolonged bleeding in her daughter? Instances such as prolonged nose bleeds, bleeding gums, or following minor procedures like blood tests or vaccines? Has there been obvious hematuria, or blood in her urine? Has clothing ever left small petechiae, or tiny vessel bleeds on her skin? When the umbilical stump fell off, did the area continue to bleed or ooze? Did the baby receive vitamin K after birth? Remember that babies haven't had very many challenges to their coagulation system so they can have a medical condition and you might not get anything positive on history.

To ask about bleeding history in family members, you can ask whether anyone is known for recurrent nose bleeds, especially if they needed medical intervention for the nose bleed, if anyone has ever needed blood transfusions, if anyone ever had problematic bleeding after surgery or dental work, or if there are any abnormality in the mother's menstrual periods or in the post partum phase. You will need enough detail to decide whether the bleeding is normal so make sure to ask open-ended questions.

Next in our differential of medical causes are the vascular causes: bruising as a result of vessels becoming leaky. We typically see this in autoimmune or inflammatory diseases like Henoch Schonlein purpura= the most common form of acquired vasculitis in kids. Systemic infections can make bruising more likely, which is why it is important to look at the general well being of any child, and ask parents for history of recent illnesses and whether they have noticed any purpuric rashes or petechiae on the skin. These infections include meningococcemia and group A strep among others. Recent use of antibiotics like penicillins could also cause inflammation of the vessels, so important to ask for medication use as well!

Lastly for medical causes of bruising are the tissue causes: Connective tissues disorders like Ehlers Danlos syndrome, which involves changes to collagen and leads to hypermobility can present with easy bruising among other symptoms. With injuries to the skin, such as what happens with crush injuries or surgeries, you can have a systemic effect on the clotting capabilities in a condition known as disseminated intravascular coagulation. Vitamin C deficiency can also present as easy bruising. Finally, some congenital birth marks can be confused with bruising such as congenital dermal melanocytosis (often referred to as Mongolian spots). Other skin findings can sometimes look like bruises, such as subcutaneous hemangiomas and phytophotodermatitis in which oil from certain plants can leave discoloration on the skin when exposed to sunlight. And there are non-medical mimics as well, such as dyes from new clothing.

The other big category in the differential diagnosis of bruising is trauma due to mechanisms of force that impact, crush or compress tissues: this can happen in the birth process and from medical procedures but once a child is able to move around well on their own, bruises usually happen from the child falling or bumping into things in the course of their normal activities.

A minority of these cases however will be the result of inflicted injury, trauma caused by force being applied by another person. Child abuse fits into this differential, and should always be included on our list to be sure we have considered it in our comprehensive history, physical exam and investigations. Other forms of trauma include: medical or dental procedures, surgeries, and motor vehicle collisions.

It is normal for young children to have some bruises once they start to move around on their own but it is not common for non-mobile infants to bruise. In fact, any unexplained bruising in a child who is not yet moving around on their own, is not normal. Remember: if a child is not cruising they should not be bruising. it's very important to ask about developmental milestones to assess whether the mechanism proposed is developmentally likely. Using the Rourke baby record, at 4 months old, an infant should be able to hold their head up while positioned prone when they're on their tummy, and be able to hold their head when supported in a sitting position. They may also be rolling over. It is checked at 6 months of age because if they are not doing it by then, it's considered delayed.

Asking about family stressors, and issues in caregiving and safety are key but sometimes can be tricky. The Rourke Baby Record offers a good guide for topics to cover with parents such as the use of car seats, whether their home is equipped with fire alarms, and how do parents deal with their fatigue and stress with a new child. Normalizing these questions by reassuring parents that we ask these questions of every parent can be helpful.

<u>Let's return to our case</u>

You astutely think to ask Cindy's mother about the bleeding history in Cindy and her family, her mother mentioned that she had a difficult delivery, and had to receive a blood transfusion. Otherwise, Cindy and her dad have not shown abnormal bleeding that can be recalled. In previous well baby visits, the pediatrician has noted adequate growth and nutrition, and no recent infections. Cindy is appropriately holding up her head when held, and is just starting to roll over but she is definitely not cruising yet, in keeping with her developmental motor stages. When asking about stressors in the household, Cindy's mom says she and her husband are happy to be new parents but they both recently lost their jobs so things have been stressful at home and finances are tight.

This history is not specific for any particular acquired or congenital reason for coagulopathy. Let's keep in mind Cindy's mother's history of poor hemostasis after delivery, however there is still more to investigate!

Of course, after a detailed history, a physical exam will be critical in providing us with a more complete picture. General inspection & observation is always the first step in any physical examination. Does Cindy appear well nourished, well hydrated, well groomed? Is she interactive? Does she respond to her father's / mother's smiles and coos? And does the parent handle and interact with the baby in a way that you would expect? Then you're going to perform a full head-to-toe physical exam.

A full infant exam includes of course, assessing the cardiovascular system, the respiratory system, abdomen, genitourinary inspection, reflexes and primitive reflexes, hip stability, red reflexes in the eyes as well as assessing fontanelles. Measuring growth in height, length

and head circumference is critical, looking for signs of failure to thrive. Examination of the entire skin surface for bruises or other superficial injuries such as burns or lesions is key. Make sure to pay attention to areas of hands, feet, genitalia, oral mucosa and ears. Look for healing injuries or scars. Look inside the mouth at the 3 frenulae – the small pieces of tissue centrally that join the lips to the gums (upper and lower lip) and tongue to the bottom of the mouth. Pay attention to any deformities in bones or joints or dysmorphisms. Do all this while keeping in mind the child's developmental abilities and the proposed mechanism of the bruises that were provided on history assessing for plausibility.

Other than the bruises noted along her clavicle, Cindy's physical exam is normal. She is alert and responsive to your voice and interacts with you by smiling, cooing and reaching. She is growing well, tracking along the 50th percentile, and shows no other sign of injury visible on exam.

Did you pick up any red flags in the initial case presentation so far? Let's first go over some red flags to remember when assessing bruises and try to see if any of them relate to Cindy's story.

<u>Red flags for inflicted injury in a child with bruising</u>

There isn't one specific location on the body or type of bruise characteristic that can definitely indicate inflicted trauma. However, certain characteristics, when put together, can raise suspicion for abuse. Once again remember: that young infants should not have any unexplained bruises – so if they do have a bruise, it requires an explanation (either medical or traumatic).

These are called the red flags that anyone working with children should know.

1. The mechanism proposed does not seem compatible with the developmental abilities of the infant or child. In this case a baby who is non-ambulatory should not exhibit bruising unless there is a plausible explanation provided.

2. Patterned bruising is also concerning for abuse and requires an explanation. Patterns that look like hand marks, finger-tip shaped, or linear configurations are often the result of inflicted trauma. But be careful, because impacts with other objects can look very similar to impact with a hand or fingers – so unless you are an expert in this field you should not definitely say that something is a hand or finger mark. You can say though that you are concerned about the pattern. Bruising that is symmetric or bilateral is also concerning and again, requires an explanation.

3. Certain locations for bruising are more concerning for inflicted injury including: soft areas away from bony prominences such as the abdomen, the back, fleshy parts of the cheeks, neck and buttocks. Bruises on the ears are really uncommon and should also raise concern. .Locations that are common for normal childhood bruising – bruises that happen in the course of the child's own movements and activities (for example from minor bumps and falls) include the anterior tibia areas on ambulatory kids, foreheads, elbow and knees. Normal childhood bruising tends to occur on the front of the body and

over bony prominences. Sometimes it can be on the back especially over bony areas (vertebrae) on the low back.

4. Bruises that are unusually large or numerous are also concerning and require an explanation

What red flags did you note in our case?

Cindy is 4 months old and is developmentally normal for her age. This means that she is really not moving around on her own yet. She can roll but is not crawling or cruising or doing other things that would lead to bumps and falls. She also should be supervised whenever she is awake. Any bruise at her stage requires some explanation. The story of the seatbelt imprinting itself into her chest is concerning because the proper use of the car seat shouldn't cause bruises and the round bruising pattern over her clavicles may not fit with the shape of the car seat belt.

There is a potential family history of bleeding disorder, but there is no other personal or family history to suggest an inherited coagulopathy.

We get the sense that Cindy's parents are going through a lot of stress raising their first child, which is complicated by the fact that she likely has infantile colic, a condition leading her to cry inconsolably for long periods of time. Mom sounds tired and hopeless. Could this stress lead to her parents not parenting in a safe way, showing frustration with her, or using more force than is normal for caregiving?

Although bruises are minor injuries and will heal on their own without any medical complications, they should be viewed in this age groups as 'sentinel' injuries, meaning that they could signal risk of current or future harm from maltreatment. In other words, these bruises should not be ignored!

Laboratory investigations

While it is not recommended to do lab testing at well baby visits, unexplained bruising in a non-mobile infant demands further investigation. Remember, it is not normal to have bruises at this age so there is either a medical or traumatic explanation. As a healthcare professional your job is to make sure that you aren't missing a medical explanation and to involve other professionals who can assess for safety. This means you will need to do some testing to exclude inherited or acquired bleeding disorders.

What blood tests come to mind?

If you're considering a complete blood count, peripheral blood smear, prothrombin time, INR, liver and renal function tests, you're right!

CBC would allow us to look at platelet numbers and hemoglobin levels to assess for any acute or chronic bleeding. This would also lead us to consider conditions like idiopathic thrombocytopenic purpura.

The prothrombin time and INR would screen for the presence of many coagulopathies. Liver and renal lab abnormalities can secondarily lead to platelet dysfunction.

While these tests are for potential medical conditions there is also a list of tests to perform if you think that maltreatment is a possibility. These include LFTs and amylase or lipase for intra-abdominal injuries.

Back to the Case

Cindy's lab work did not show any concerning abnormalities; all values were within normal limits.

At this time, it is important to acknowledge the utility of of a multidisciplinary team. Because of the difficulty to diagnose some coagulopathies, secondary testing with specialists is recommended if there is suspicion based on family history of a coagulopathy, even if primary tests are normal.

IF there is not a clear medical explanation, in children under 2 years of age where there is concern about unexplained injuries, it is recommended that imaging be done to look for injuries of the head, bones and eyes that might not be visible on exam. This means doing a skeletal survey (Xrays of all of the bones), CT scan of the head and specialized ophthalmology exam by an ophthalmologist. These examination assess for acute or healing fractures, retinal bleeding and potential head trauma.

Okay, so if you were concerned throughout this podcast that Cindy might be at risk, I would have to agree with you. There are some red flags, there seems to be no medical cause for the bruising and there is no other explanation being provided. As a result, you have a legal obligation to report your concerns to the local child protection agency, often called the Children's Aid Society or Child and Family Services. At this time, you may be asking yourself what does the role of the healthcare provider look like in actual practice?

I'd like to hand it over to Dr. Michelle Ward, pediatrician and head of the Division of Child and Youth Protection at the Children's hospital of eastern Ontario, with whom I was able to develop this podcast. She is the primary author of the CPS position statement on bruising that inspired our talk today.

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It's not surprising that people get a little flustered when they think that the child in front of them might have been hurt by a parent or other caregiver. It's a difficult situation for everyone. But health care professionals have all the skills and training they need in order to manage these cases. Sometimes they just need a few tips on how to do it.

What do I want health professionals to know?

First, treat these like other cases and just go through your normal steps. At the same time, remember that you have a duty to report if you suspect a child or youth has been maltreated

(abuse or neglect) or is at risk of maltreatment. How do you do this? Pick up the phone and call the local child welfare authority. They will want the family's demographic information and then other information. I suggest you use the mnemonic ICE. It will remind you to stay cool and calm and helps guide you on what information to share. You're not obligated to share everything in the patient's chart – only the information that pertains to a possible child maltreatment concern, and you can give this information without worrying about breaching confidentiality. In fact, in Canada, you are required by law to give this information to the child welfare authority.

So, ICE stands for

I – information. Share the concrete objective information so in this case that would be something like….This 4 month old girl came for a routine visit today with her mother. When I was examining her I noticed three small bruises near her collar bone. Apart from this she looked well and had a normal exam.

C – Context / Concern. In this case that would be….so I'm concerned even though these are bruises that will go away on their own, because Cindy is not yet moving around much on her own and babies who don't move around much shouldn't have unexplained bruises. Her mother doesn't know how her daughter got these bruises and can't think of anything that might have happened to cause them. So, because it's not normal for a young infant like this to have bruises, it raises two possible concerns – one, a medical condition that causes bruises (for which I'll do some testing) and two, the possibility that she was injured. This could happen by a fall or being dropped (but her mother says this hasn't happened) and it could also happen by maltreatment.

E – Effect. You want to communicate what the effect is on the child so that the child welfare professionals know how quickly to act. In this case, I would say, the baby seems well but she will need other testing to make sure she doesn't have other injuries.

It is always good practice to tell the parent or caregiver that you are going to place a call to the child welfare authority. If you explain clearly and without judgment, the parent should understand why you have to make this call. That doesn't mean that they won't be upset. They will be upset and that's expected. Our job is to support them through this difficult situation.

In this case, I'd say something like. "These bruises near Cindy's collar bone aren't normal. They'll heal up and go away, I'm not worried about that. But I am worried about how she got them. It's not very common for babies Cindy's age to have bruises without a good reason. They could be caused by a medical condition that we are just seeing now for the first time and I'm going to do some blood tests to check for that. But they also could be a sign of injury. You told me that you don't know how they happened and I don't know how they happened either. Because Cindy is so young and she has these injuries that we can't explain I also have to call the child welfare authorities. It's their job to try to help figure out how these injuries happened and to make sure that Cindy is safe.

At this point the parent will probably become upset and may ask you if you're accusing them of abusing their baby. You can honestly answer, "I'm not accusing you or anyone else.. I know this is upsetting and might feel like that though. Since we don't know how the bruises happened this is just one of the things I have to do to try to figure it out.. When I see bruises I know that they can happen from medical conditions and from trauma. As a doctor I can do the testing for the medical conditions. But by law whenever I see a young child with an injury that I can't explain I also have to call the child welfare authorities for them to do their job. I know that is upsetting or might sound scary, but I also know that we both want to figure out how Cindy got the bruises on her chest." What you are trying to do is to find common ground with the parent. You want to focus on the child as opposed to focusing on the parent or their actions. And you want to be clear and professional about what you're doing. If the parent feels like you are hiding something or are not being up front with them, it will make it worse. Make sure to repeat information if you need to and to ask the parent if they have any questions. The parent's emotions might make it hard for them to hear or remember all that you are saying. I like to tell parents that what I have just told them is the same information that I am going to share with the child welfare professionals and that I will share information back with them as much as possible. Don't make any promises about what is going to happen next, because you don't know what the child welfare social worker is going to do, but just try to remain supportive and compassionate towards the parent. This is a really hard situation for them to be in.

After your discussion, make sure you write notes right away. These should include clear descriptions of what you found on exam, with drawn diagrams or use medical photography if it is available. You should also document any spontaneous statements made by the parent or child that may be relevant.

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Thank you so much, Dr. Ward, for your insight in the practical approach to suspecting child abuse when a patient presents with bruising. The ICE mnemonic is a great tool to keep in mind when expressing your concern to your staff, but also to the child welfare authorities, as mentioned.

If we return back to our case, how would this change if our child in the case was 4 years old instead of 4 months old? Would you be as concerned about an inflicted mechanism? What about a coagulopathy? If we think of our red flags, we can expect a 4-year-old child to be able to walk and jump and run and as a result get the occasional bruise on the leg, or head through a simple accident. But bruising along the collar bone – it is on the front of the body and it's over a bone? So it is definitely possible that she had gotten that during routine play. But we don't know how it happened from just looking at it so The mechanism becomes very important here- Does the parent know what happened? Does Cindy know what happened? are we thinking of a platelet disorder? Could pressure from a seatbelt been responsible? No matter the age of the child, the same approach we have been discussing so far can be applied to each clinical presentation, so that you can be sure to be thorough in providing the necessary care to the little patient in front of you.

Pediatric Education Online

In summary

Regardless of your future practice, your training as a medical student will at some point involve you in being part of the care for pediatric patients in some capacity. The presence of bruises should alert you to several things, so let's go over these take-home points once more:

1. Bruising is the most common finding in child physical abuse, and often the most underreported sign

2. Bruising in young kids can be caused by trauma or medical conditions, or a combination of the two.

3. There are red flags that should make you stop and think about inflicted injury as a real possibility:
- bruises in less common areas like the ears, neck, feet, buttocks or torso; or not on bony prominences
- unusually large or numerous bruises;
- bruises occurring in patterns or in clusters;
- bruises that don't fit with the described mechanism or developmental stage

4. As Dr. Michelle Ward shared, remember the ICE acronym during practice when communicating your concerns to your staff, and to your local child welfare authority: I for information, C context and communicating your concerns, and E for effects on the child.

5. Ultimately, by recognizing concerning bruising, physicians may be able to prevent later injuries that could result in significant consequences for the child.

This brings us to the end of our PedsCases podcast. We hope that it has been a helpful introduction to learning how to best care for our young patients. We wish you all the best in your studies and rotations, and thank you so much for listening!

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