

What is the Medical Evaluation - Pediatric Grand Rounds-4-18-25-Meeting Recording

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57m 19s

● **Kamat, Deepak M** started transcription



Calderon, Delia 0:04

There you go.



Kamat, Deepak M 0:12

Good morning and welcome to pediatric grand rounds.

April is a child abuse Prevention month, and so therefore we'll be having two talks, this one and the next week's talk on topics related to child abuse. The semi code is in the chat box and unfortunately it's not counted towards the medical ethics.

It's just a regular CME.

Credit you will receive.

It's my great pleasure to introduce this morning's.

We are not speaker. Our our own doctor, Natalie Kasona, who is the associate professor in the Division of child abuse pediatrics in the Department of Pediatrics here at Joint Resolutions School of Medicine.

And she's also the fellowship program director for child abuse Pediatrics.

Doctor Kasun graduated from Emory University in 2003 and attended medical schools school at University of South Florida College of Medicine from. 2004 to 2008, she.

Computer her training and periodics residency at Children's National Center in Washington and in 2011, and fellowship in child abuse pediatrics at the Lawrence Auburn Senior Child Protection Center at Hasbro's Children's Hospital at Brown University in Providence, RI, in 2015. Doctor.

Christian is a member of Rayhelper society, the American Academy of Pediatrics and the Texas Pediatric Society.

She's member of the Executive Committee for the American Academy Pediatrics Council and child abuse and neglect. Doctor Christine serves on the child abuse Pediatrics sub board at the American Board of Pediatrics.

Doctor Kasun, thank you very much for accepting our invitation. The floor is yours.



Kisson, Natalie N 1:58

Thank you so much.

I appreciate you having me here during April.

Wearing blue to represent for child abuse prevention month.

So today we are going to talk about some things to help you recognize child abuse when a patient comes to you for care.

I have no disclosure of my one disclosure is that I provide consultation and testimony in cases of child abuse.

Both for.

Cases for like a defense or prosecution's side.

So some objectives for today, we're going to talk about some through case based discussions. We're going to talk about how to recognize injuries that are concerning for abuse and we're going to understand what the medical evaluation is in cases of suspected child maltreatment.

Our first case is called cute aggression.

This is a 5 month old who was in kinship foster placement and went to daycare and had bilateral cheek bruises. Their caregiver reported that another caregiver had pinched his cheeks too hard. A caseworker made an unannounced visit to the daycare and saw these injuries and contacted us at.

The Center for miracles.

We immediately were concerned and referred this child to a local emergency department.

With getting a head CT and a skeletal survey, those studies were negative after those studies were conducted, the Ed physician and the case worker reassured, and there was some speculation that a 2 year old in the home may have caused these injuries. And so the child remained in this home five days later.

He presented to the hospital with a fatal head injury.

Great.

We're gonna come back to our case, but first we're gonna talk about some different pieces about this case and eventually get to why this was what parts of this case was so important to understand.

So first thing we're gonna talk about bruises as this is what this child presented with.

One of the things I think about when I see an injury is what caused that injury.

What is the mechanism for that injury?

How does that injury occur?

What has to happen?

Into the body for that injury to happen. So in this case we have bruises. So what are the mechanisms of bruises?

Blunt impact squeezing and or crushing.

Next, let's talk about in mobile children.

So not our children. Our child in our case.

Where goody goody bruises it does not make us concerned that a child has bruises.

So those are anterior bony surfaces.

Of the body foreheads, nose, chin, elbows, forearms, hips, knees, shins. Right. When I see bruises here in a mobile child, I am not concerned because this is where I expect to find bruises.

Because kids are running around, they're exploring.

And this is where they're going to hit and cause blunt impact and cause those crushing up those blood vessels because these are the places where the skin and the bone are pretty closely approximated.

So that's where there's not a lot of cushion under there.

So we expect to see bruises there.

Let's talk about the places that are concerning.

So these are places where you don't expect to see bruises from accidental injuries because these are protected areas of the body. They are areas of the body where there's a lot more fat and subcutaneous tissue.

So you expect more cushion, so it takes a lot more force to cause bruises there.

So we talk about the torso, the anterior and posterior torso.

Sometime between 12 and 15 months, kids start to put their hands out when they fall to protect themselves, and so they're less likely to impact their torso, their front, their chest. When they fall their back.

Most kids fall in their buttocks, not directly onto their back when they fall, so it's unlikely to get impacted.

And then your abdomen.

Is a soft, squishy place with a lot.

Doesn't have any bone to crush those to those tissues against. And so it takes a lot more force to cause bruises on the abdomen, moving on part of the torso, the genitals in the buttocks again, because these are protected areas, especially in young children who who are still.

Diapered the buttocks has a lot of cushion on there. The genitals again in a diaper area is a protected area of the body.

The face and the ears when we talk about the face. I'm talking about the soft part of the face and the ears because the ears is not typically injured accidentally. It's usually when you fall to the side you hit the top of your head, you hit your shoulder.

The ears, a protected place. Also the ears.

There's not a ton of blood vessels there, and so it takes a little bit more to cause bruising and bleeding in the ear.

The neck again, a well protected area that we don't typically see bruises as well as the eyelids and the and the sub conjunctiva.

So the eyes are protected by the orbital. You know, the orbit essentially right.

The bones around there protects the eyes, and so you don't expect to see bruises.

Their direct impact is one way that you get bruises and the sub conjunctival hemorrhage. Again, direct impact is how you'd expect to see those now sometimes. People are concerned that babies who cry a lot or babies who are constipated or having coughing is gonna that Valsalva is gonna 'cause that sub conjunctival hemorrhage.

There have been several studies looking exactly at that, and infants presented the emergency department with colic so hours and hours of crying or in seen anecdotic clinic hours and hours of crying.

With pertussis or infants with.

Constipation. They are not presenting with sub conjunctival hemorrhage.

And so the thought process is we don't think that those children can generate the Valsalva pressure to cause those blood vessels, those sub conjunctival hemorrhage.

So sub conjunctival hemorrhage is a concerning thing.

Oral injuries are also concerning, especially in infants, so we have frenulum.

We have 3 frenulum, the two that connect our lips to our gums and then the one underneath our tongue. And those can be injured by forceful insertion of an object.

We also need to make sure we looked at other parts of the mouth.

So the the inside the cheeks as well as the tonsils and the pharynx. We've had infants come in with.

History of oral bleeding and when you look in their mouth, their frenula intact, that you don't visually see anything. And then on further investigation and evaluation, we find that they actually have a tear to the fairings. That is really hard to visualize.

However, bleeding from the mouth is not something that happens typically from

GERD or from any other kind of.

Medical problem.

And so trauma is the most likely cause for that to happen.

And so we have to explore and and evaluate for that in addition to looking for all of the other things.

Oftentimes, the history of blood from the mouth is important because the blood is highly vascularized, and so these injuries bleed a lot.

But parents don't typically bring kids in. When this with, you know, the complaint of leaning from the mouth. In this case of this photo that that did come in and this was an acute injury, oftentimes we find these injuries.

By as an incidentaloma, if you will.

And so we're doing an evaluation, doing a physical exam and looking in the mouth and then we see this granulation tissue and that's how we find these injuries. And then you go back and ask a question.

The family has there ever been any blood coming from the mouth anytime where this child was having difficulty feeding and we find a history of something that has happened in the past.

So it's really, really important that when you're doing your physical exam that you look at all the different a complete physical exam taking off a diaper to look in that diapered area, looking in the mouth, making sure you see all those formula and making sure that you see.

All the different parts and if the family is coming in with a history that's concerning for trauma, even if at that time you're not seeing any evidence of trauma, then that is something that deserves further evaluation and discussion.

Let's talk about the age and development.

I started off a case with an infant, and then we talked about where mobile kids and then we went back to talking about some injuries that are more specific in infant.



Pearson, Rachel M 11:29

Thank you.



Kissoon, Natalie N 11:30

So we're gonna get. We're gonna talk more about, you know, our infant that came in and why it was so important to recognize those injuries.

So in child abuse we have a saying if you don't bruise, you don't bruise.

And what that simply mean is is that mobile children will have more bruises than non mobile children.

And that makes sense. When we talk about mobility for us, we're talking about a child who is not yet crawling, not pulling to a stand, not cruising along furniture.

So the infant, who is rolling over.

And scooching along, we do not expect to see bruises.

Unexplained bruises in those infants.

So because of that, any bruise anywhere in an immobile infant.

Requires further evaluation and physical abuse.

Should be on your differential high up on your differential, especially if the caregivers cannot give you a consistent history to explain this injury. And when we talk about a consistent history, we talked about what the mechanism of a bruise is, so.

So you need to think about that and then when you go in, you ask what happened and you don't tell them the mechanism you're looking for, but you listen to what the caregiver says and see if that mechanism is somewhere within that history and if it is. That's that's good.

If it isn't, then you need to think about what else we need to do.

How? What? What? Further things we need to. I will say that.

In general, seeing infants with lots and lots of bruises, it is very rare to have an accidental cause, and it is a pretty significant thing that that happens that causes that causes bruises and infants in an accidental manner.

Normal care and handling of an infant should never result in a bruise.

That brings me to this concept of a Sentinel injury.

So a Sentinel injury is a minor, detectable and poorly explained injury in a in an infant.

I want to tell you a little bit about the study that we use to create this term, the Sentinel injury.

So this was done by the child abuse team in Wisconsin, and they looked at 400 cases. Of Child of children that their team evaluated. In those cases, 200 of them, they determined, were the injuries were caused by abuse.

100 they determined, was indeterminate.

They couldn't tell whether it was abuse or not, and 100, they determined was not abused.

And then they went back in the medical records for these infants and.

Talked with the parents and determined if these infants had ever had any.

Previous injuries before and what they found was that in the 100 kids that was determined to not be abused, none of those infants, either by history or documented in the medical record, had any other injuries in the indeterminate group, 8% of them had a previous inj.

And in the group that was abused, 27% of them had a previous injury.

Most of the injuries, 80% of the injuries, were bruises.

Some of them were a small percentage.

About 11% were oral injuries and then 7% were other injuries.

Most of these kids, 95% of them, were less than seven months, 66% of them were less than three months, and they also saw that these injuries were often missed in the cases that did have.

Injuries 42% of the time, a medical provider was aware that these injuries were there.

And as you remember, this was going back in time.

So these kids came back with more injuries and some of them worse than the previous injury.

So it's really important that you recognize and understand what injuries are concerning in infants for abuse so that we don't miss it.

So we call these, we usually use this term only to refer to bruises and infants. We call them a Sentinel injury.

And they deserve further evaluation.

Here is a great tool to help you remember what injuries are concerning.

It's a bruising, clinical decision rule and basically when something falls into this decision rule, it says it requires further evaluation.

It doesn't say that it's definitively abuse, but it does require further evaluation.

So 10 four phases, P10 refers to the torso, ears and neck faces the frenulum.

The reminding you to do that intraoral exam.

The angle of the jaw.

Cheeks, that fleshy part, the eyelids and the sub conjunctiva 4 refers to the age 4 months and younger.

So those immobile children, any bruises anywhere, requires further evaluation, and then P refers to patterned bruises.

So bruises in a specific pattern, like a slap mark or grab or a loop mark when we see a pattern. It's suggestive of an object.

From a medical standpoint, we don't have to determine.

And what that object is. But sometimes because of our experience of patterns that

we've seen in the past with histories, we can make some comments about the possible object.

Is it flat?

Does it have a texture?

Is it flexible because the injury the bruise wraps around the body and so we can talk about that?

Give some comments to help our investigative partners.

Now you can get.

Posters for 10 four faces P that you can put in emergency departments or in your clinic.

So you don't forget from if you Google 10 for facesp.

This was developed by the child abuse team at Lurie Children's Hospital in Chicago, and they have downloadable posters and things that you can use for free on their website.

Let's go back to our child.

So what things are concerning here?

So this is a 5 month old mobile E mobile and then they have a patterned bruise on their.

Cheeks, it's on both cheeks.

So for that reason is why we immediately for referred them to the emergency department and you'll hear me say this again, despite the fact that the head CT on the skeletal survey were negative, it does not rule out a DSR abusive injuries.

The reason we do those additional studies is to look for occult injuries, not to use the result of them to confirm that these injuries are indeed abusive.

Speaking of the medical evaluation, let's talk about what that entails.

First of all, a complete history. A head to toe exam, looking at everything, looking in the mouth in the diaper area and good photo documentation.

It's important to have photo documentation because you may describe something, see something in a color that I may see differently and describe differently.

But if we're looking at the same photo, then there's no disputing what we are.

Looking at.

As I talked about, we have to screen for a cold injuries because studies show that if a child has one abusive injuries, they are likely to have another abusive injuries.

And so one thing we do is a skeletal survey.

This happens in every child less than 24 months when there's a concern for abuse,

and then we consider it in that older age group, 3:00 to 5:00. If they have egregious injuries or the child is non verbal and sometimes even older.

Again, depending on the development of the child, it's a series of 22 X-rays that needs to be conducted in a very specific way. This is one poster that we have that shows radiology text exactly how to position a child to get a appropriate skeletal survey and.

It's important that it's done in the appropriate manner because of all the different things that we're looking at. We don't want to miss anything.

As part of screening for occult injuries, we also need to worry about intra abdominal injuries even if the child does not have any symptoms or have any external signs of abdominal injury.

We do that by getting Ift's and then we get a abdominal pelvis CT with contrast. If the Ift's are greater than 80 or if the child is having symptoms or the child has abdominal bruising.

In young children, we also need to screen for occult injuries because their neurologic exam is not as reliable as in older kids.

So if you are concerned for physical abuse, regardless of the presenting injury in infants less than six months of age, they should get a head CT recommend doing that. 3D reconstruction helps us see the fractures and understand the mechanism for those a little better and then of.

Course in older children, if they're symptomatic, they have Poly trauma, facial injuries. Then you would want to get a head CT also.

Additionally, we don't only screen for other injuries, we also need to make sure that there is no underlying medical problem. And so in the cases of bruises, we need to rule out bleeding disorders. And so these are some of the tests that we might do when we are.

Concerned that there might, we won't need to rule out an underlying medical problem that's leading to bruises in this child.

This is another case of a 7 month old who presented to the Ed with unexplained bilateral periorbital.

Ecchymosis.

Sometimes you can see this pattern of bruising when you have a hematoma on the forehead because of the dissection of the blood through the facial plains and it settles below the eyes.

However, when you don't have a history or you see signs of that forehead hematoma

and you have this bilateral ecchymosis, then that's not explained.

In this case, we recommended the full medical evaluation with labs, a head CT.

Skeletal survey this child, the head CT, had no intracranial abnormalities.

Skeletal survey showed no abnormality showed an abnormalities that was concerning for metaphysical osteolytic lesions.

Her labs.

Her significance for Leukocytosis anaemia and thrombocytopenia hyperuricemia elevated LDH. She was diagnosed with leukemia.

And so finding these underlying diagnosis is why we're doing these labs.

In these in some cases I say some cases.

How do you know which cases you need to do lab work in for bruises?

The American Academy of Pediatrics has published a clinical report on the evaluation for bleeding disorders and suspected child abuse.

This QR code will take you will link you to this study to this paper and in that paper they have an algorithm which tells you which children when there's a concern for abuse, require a bleeding evaluation and it tells you what the bleeding evaluation is.

So I have.

This printed out.

And kept with me when I'm on call so that I always remember and know what things I'm supposed to do.

Now we're going to move on to our next case.

This case is called tight hugs.

This is a four month old who is admitted to the hospital for concerns of failure to thrive with a history of persistent vomiting and diarrhea and a history of a bruise on the face. Because of this history of a bruise on the face.

Again, she did not have a bruise at the time of the evaluation.

A skeletal survey was ordered.

The Skeletal survey showed multiple bilateral healing rib fractures in various stages of healing.

A head CT showed bilateral subdural hemorrhages.

Potentially, her persistent vomiting could have been related to her head injury, which then subsequently led to her poor weight gain.

Because we have multiple rib fractures in various stages of healing.

These findings suggest multiple episodes of trauma.

We're going to talk about rib fractures.

Studies show us that 80% of these in kids under 2 are from abuse.

They rarely occur from birth.

And usually they are associated with other birth related trauma, such as a clavicle fracture or history of shoulder dystotia.

You can see rib fractures from motor vehicle collisions.

CPR can cause rib fractures also.

Regardless, either the two handed CPR or the, you know, the the one hand CPR that we that we did previously and those fractures are usually anterior lateral and you would not expect to see healing if CPR is the cause.

The mechanism for rib fractures in infants is anterior posterior compression of the chest or direct impact.

So when we talk about that anterior posterior compression of the chest, why does that cause rib fractures? And which of these rib fractures are we most concerned about caused by abuse?

So in this photograph I have a number one and #2 highlighted because those are the posterior medial aspects of the ribs.

And when you have that anterior posterior chest compression, you have those rib heads bending over that vertebrae, causing those posterior medial rib fractures.

Now you can also get rib fractures and other parts of the ribs at the posterior aspect. The lateral aspect, the anterior and the anterior lateral aspects of the ribs from chest compression.

But these other fractures can also happen from direct impact.

But these fractures here, the posterior medial ones, are unlikely to happen from other mechanisms besides anterior posterior chest compressions. For that reason, post.

Rib fractures are highly specific for child abuse.

What is the medical evaluation?

It's the same as we talked about with looking for occult injuries. Additionally, in kids who have fractures, especially multiple fractures, we need to make sure there's not an underlying metabolic bone disease.

So we need to do bone health labs and potentially genetic testing.

Let's talk about some of these underlying metabolic bone disease and how these may show up in as mimics of child abuse.

Rickets is one that is commonly put forward as the cause for multiple rib fractures in children.

So of course, rickets is from prolonged vitamin D deficiency, which leads to

demineralisation on X-rays. You see the loss of the zone of provisional calcification widening and irregularity.

Three of the faces, and fraying and cupping of the metaphysis. And these are some examples of a child who does have rickets and you see demineralisation, and you see these fraying at the ends of the bones. The thing to remember about this is that it is. Seen throughout the entire skeleton.

It's not isolated to one bone.

You see these Bony changes because rickets is a systemic, systemic issue.

So this these X-rays are from a 7 year old who has known rickets and was at the pediatrician's office and jumped off the exam table and had a femur fracture.

And came in because of that and we see all of these findings.

So what about Ricketson fractures?

So let's talk about the numbers first.

So in general, less than 20 is the vitamin D deficiency between 20 and 29 is insufficiency.

And then greater than 30 is considered normal.

So studies show us that metabolic bone disease is not associated with vitamin D levels greater than 20.

So that's the first thing to think about.

Looking at kids who have fractures, there was no difference seen in the fracture in the vitamin D level of kids with fractures or the vitamin D levels of kids without fractures.

Vitamin D insufficiency has also not been associated with multiple fractures, including rib fractures and cml's. One study looking at kids with rickets showed that they do get fractures, but those happen in mobile children.

Those kids who are walking, running, climbing.

And those kids have radio graphic evidence of rickets.

And so it's unlikely that a vitamin D deficiency alone without radio graphic evidence of rickets, will lead to fractures and multiple fractures.

Especially if we see that in an immobile child.

The other thing we think about is dementalization from disuse.

So those can lead that can lead to increased fractures.

These children will have a history of limited mobility.

There'll be radio graphic evidence of osteopenia other Bony abnormalities, and usually these fractures are of the diafosis of the bone.

This is a 2 year old with septooptic dysplasia and developmental delay who came in with swelling of the thigh and leg pain and has these fractures and oftentimes this we think these fractures can happen with physical therapy, occupational therapy and other care and handling of these children.

Another thing that's been proposed to cause fractures in infants.

And as a mimic of abuse is osteogenesis imperfecta, so this is the mutations in the Col. 1A and Col. 1-2. Most cases of osteogenesis, imperfectors, autosomal dominant and so you would expect to have a family history. However, there can be denovo mutations.

So having this mutation causes the bone to break with minimal trauma, and often times we can see osteopenia.

And potentially other Bony abnormalities on imaging these children can also have other features, including a blue sclera growth failure, macrocephaly wormian, bones of the skull, dentagenesis imperfecta, which is weak, discolored or translucent teeth. If they have teeth, hearing loss, scoliosis, limb deformities, hyperextensibility of the joints.

Bruising has been shown in older in adults to be associated with EOI.

And then, of course, they can have some cardio pulmonary complications.

Studies comparing children with OI to children without OI find that children with OI have fractures that are different. So children with OI can have transverse shaft humerus fractures and olacranon fractures versus children without tend to have fecesal fractures or supracondular fractures.

Infants with multiple long one fractures or rib fractures.

Usually studies show have other signs of OI and not just fractures as they're presenting sign.

So this is an example of an infant with OI.

This is a phenotype that has these Bony abnormalities and the blue sclera. What that might look like. We're going to stay in the vein of fractures and we're going to talk about femur fractures with tails of femur fractures.

So this first case is a 5 month old with unexplained leg pain.

The history is her leg was possibly caught underneath or near an adult caregiver who heard a pop and immediately noted that this leg was lip.

This is another case.

This is a one month old who had pain during and immediately after a diaper change with subsequent decreased movement and pain for four days.

And finally, we have a nine month old who's had two days of increased fussiness and left thigh pain. Caregivers have had concerns for pain when held standing up. And he was not crawling.

And they brought these concerns to caregivers.

To medical providers, including PCP and Emergency department on several occasions and this is the fracture here for that, kiddo.

In general, these are the fractures that have high specificity for abuse. We already talked about rib fractures. This posterior medial 1.

Classic metaphysical lesions, also called bucket handle fractures or corner fractures. Scapular fractures, spinous process fractures, and sternal fractures.

The reason that these fractures are highly specific for abuse.

Is because routine care and handling of a child should not result in these injuries.

Additionally, some of these fractures require high energy mechanism that does not typically result from household accidents or incidents.

Outside of these very high specific injuries, ultimately any fracture in a typically developing child of any age without a plausible accidental mechanism of injury is concerning.

So any fracture can be caused by abuse.

It all depends on the mechanism and the history and whether whether they are consistent.

What do we know about long bone fractures and abuse?

They are more likely to occur to be abusive in non ambulatory children that make sense. The most commonly injured bone by abuse are the humerus, the femur, and the tibia.

Studies show us that up to 54% of humerus fractures in children younger than three years of age are attributable.

Are caused by abuse.

And specifically in those less than 15 months of age and then when we look at lower extremity injuries, those younger than 18 months of age, nearly 75% of those were a result of abuse.

Let's talk about the femur fractures that we had and the mechanism for those.

This is the mechanism for a spiral fracture.

It's a twisting force around the long end of the bone. For example, we can see this in a kid who's running and tripped on a rug.

Or are all of our kids. Those fractures were classified.

The three cases that I showed you were classified as spiral fractures.

We can also see oblique fractures, which I like to think of as an interrupted spiral.

So you have torsion and then bending.

That leads to this kind of fracture.

What do you need to think about when you're evaluating a child with a fracture?

Fractures hurt at the time of the injury. That child had a pain response.

There should be some history of trauma.

Oftentimes there's limited or decreased use of the limb, and sometimes it's accompanied by swelling.

Sometimes it's hard to tell, especially in our infants, who have a lot of roles.

But most notable is this pain response, they say.

My infant cried differently in all three of my cases, that was the that was the case as well as limited or decreased use or immediate, noting that something was wrong.

Let's talk.

Let's go back.

To our kiddos.

Oh, one thing about bruises is we do not expect to see with fractures. We do not expect to see a bruise.

The only fracture that is consistently associated with a bruise is a skull fracture. When you have a scalp hematoma, other parts of the body that when there's Bru, when there's a fracture, we do not expect to see a bruise, and studies have showed that over and over again.

And in our clinical experience, we've seen lots and lots of kids with fractures.

And they don't typically have bruises overlying the fractures.

All right, back to our kiddo.

So this is our five month old who had that history of something popping when they were next to a caregiver in that caregivers sought care.

Immediately, she had a head CT and a skeletal survey that did not show any other injuries.

What the caregivers described was an incident in which her leg or foot could have been caught under or on the clothing of the caregiver.

It was difficult for the caregiver to give very specific.

Of the of the injury, which is understandable given the, you know the result of it and the chaos that followed. Acps report was filed a follow up skeletal survey was completed and this child did not have any other fractures.

All of the labs were normal.

Ultimately, we diagnosed this as a non specific meaning.

I can't say this is abuse, nor can I say it didn't happen.

During that interaction.

That was not routine care and handling, but something outside of that.

In our other child are one month old.

The caregiver reported that this child started crying during a diaper change and thereafter had decreased movement of the limb.

Caregivers watched this child at home for four days prior to seeking care as the legs sometimes moved spontaneously.

Head CTE, skeletal survey and labs were all normal.

Acps report was made and a follow up skeletal survey was completed with no other injuries seen.

Ultimately, our diagnosis in this case was physical abuse, as changing a diaper's routine care and is not expected to result in an injury in an otherwise healthy infant. And finally, our nine month old. So this child had been fussy for two days and had left thigh swelling.

Caregivers have had concern for pain when he held standing up and not crawling for some time and had following findings. The findings on imaging, where there was osteopenia throughout these findings, raised concern for systemic process.

A report was made to CPS because it's an infant and a mobile infant with a fracture.

Ultimately, we made the diagnosis of non abuse and this child was diagnosed with osteogenesis imperfecta on genetic testing.

So these are some examples of what his imaging looks like. He had a deformity.

Fracture of this vertebrae as well as generalized.

Osteopenia throughout there was thought to be a fracture here. He also had findings in his teeth and jaw, so those were three cases of femur fractures in which we had three different diagnosis based on a complete evaluation. For all of these kids, including reports to CPS and ult.

Coming to three different conclusions based on the history.

Of the injury.

Our next case it's called.

It's all in your head.

This is a four month old who presented to who was admitted to the hospital because of an outpatient MRI showing these bilateral subdural fluid collections.

History for this child is that they had persistent vomiting from 4 to 8 weeks of life. There had been multiple switches in formula several two negative abdominal ultrasound to rule out pyloric stenosis and eventually at approximately.

Between.

1 1/2 to two months diagnosed with reflux and started on Pepcid, which is about the time that the vomiting stopped.

When we look back at the medical records, we see that at two months of age, the head circumference had increased significantly and continued to increase. At the four months of age. At two months it went from 30th to 97th percentile and then to the 99%.

At four months of age.

At four months of age is when a head ultrason was done.

To that shows this bilateral fluid collection and an outpatient MRI was ordered.

As the child was developing, had been meaning developmental milestones and so was not felt that this was an emergency.

And and that's when we got that MRI.

This leads us to talk about abusive head trauma.

This is the CDC definition.

It's injury to the skull or intracranial contents of an infant or young child due to inflicted blunt impact and or violent shaking.

This leads to inertial brain injuries with rapid whole head acceleration and deceleration.

Oftentimes it's described as shaking and can have impact or no impact, and because the head is tethered to the body by the neck, this movement is also rotational.

Who are most likely to be victims of abusive head trauma?

They're more likely to be male, with a median age between two to six months of age, and children who are premature or part of a multiple.

Gestation have a developmental delay or disabled are more likely to be harmed.

Why are infants so vulnerable?

Because their heads are relatively large compared to the rest of their body, and so they respond differently to that movement.

Also, they have weak cervical musculature and their brains are generally UN myelinated and they're a subarachnoid.

Spaces are more prominent, and so because of all of these anatomical things.

When you have those forces applied to their bodies and heads, they respond

differently and result in the injuries that we see compared to older, older children and adults. Additionally, making them at high risk is that they're nonverbal and so they cry to communicate and crying can be very.

Triggering and.

Frustrating for caregivers when they can't stop.

And then caregivers have unrealistic expectations of children.

We often hear that subdural hemorrhages is synonymous with abusive head trauma.

The reason that that those two things have been linked together is because the subdural hemorrhage is a marker of these inertial forces.

We have these bridging veins that stretch and tear when we have the kind of forces I told you about.

So this is a cartoon of that bridging vein, moving through that potential subdural space.

So remember these spaces.

These are all potential spaces, not actual spaces.

So we have this bridging vein moving through this subdural potential space.

One, we have that rapid acceleration, deceleration, we have our brain and our skull moving differently, which causes tearing of those bridging veins that then leads us to have these subdural hemorrhages.

I said, you know, most times people think subdural hemorrhage is synonymous with abusive head trauma.

However, we can have accidental subdural hemorrhages, focal subdural hemorrhage, a small subdural that can be caused by a contact injury.

Again, still caused by tearing of bridging veins, usually you see this at the site of impact. It can happen in short falls, and they typically do not result in severe injuries.

So this is an example of a child who had a fall off the bed and we see here soft tissue swelling with a small underlying subdural hemorrhage. And then on.

When we see that there's a fracture there.

So this is consistent with that history.

This child is completely asymptomatic and may present several days later with soft tissue swelling because it may take up to 10 days for scalp swelling to be appreciated by a caregiver.

In incidents like this, what subdural hemorrhages do make us concerned for abuse?

It's those that are diffused by lateral in the falls in the posterior fossa.

Those are more likely to be due to abuse, and if they are acute they can result in

severe symptoms.

Most of them are not space occupying and the symptoms we see are a result of the secondary underlying brain injury that resulted when we talk about primary and secondary injury and abusive head trauma. The primary injury is the injuries that occur as a direct result of the TRA.

That skull fracture from that impact, the hemorrhaging, the soft tissue swelling. And then our secondary injury is what occurs as a result of our body's response to the trauma.

So the cerebral edema, the anoxia de neuronal brain death.

In abusive head trauma symptoms progression depend on the degree of primary and secondary brain injury. The greater the degree of primary brain injury then you have more rapid onset of symptoms and sometimes this can be immediate and sometimes fatal.

The thing that makes abusive head trauma so difficult is that the presentation is varied because of their varied response. Those primary injuries, and so a kid with abusive head trauma could have fussiness.

Vomiting could present and be diagnosed with a bruise have a bulging, fontanel macrocephaly facial injuries, difficulty breathing and cardiac arrest, and I think we can all agree that the first three things on this list are things that come.

Present all the time.

And most children, there's not abusive head trauma.

However, for some there might be the other thing about abusive head trauma is that kids can recover from mild primary injuries.

Minimal secondary injury and so it can get better and they don't present to care.

Let's talk about our case. Caregivers in our case, reported a history of a bruise close to the time of facial bruise close to the time when the vomiting started.

It is possible that this child recovered from an abusive head injury at the same time that they coincidentally started medication to treat reflux.

As with any child under 24 months, we had any concern for abuse. A skeletal survey was done in our kiddo did not show any other injuries and had a bleeding disorder evaluation also because when you have intracranial hemorrhage at.

As the same with bruises, you have to make sure that you don't have an underlying bleeding disorder.

That's causing a child to have intracranial hemorrhage.

So we'll go back to this paper, the evaluation of bleeding disorder and suspected

child abuse in that same paper. There's also another algorithm for when you need to evaluate for bleeding disorder in children who are concerned for abuse with intracranial hemorrhage.

So again, this is another tool that I keep at the ready to make sure that I'm.

You know, doing the correct medical evaluation.

What else do we need to look for for these kiddos when we think about abusive head trauma?

When you have intracranial injuries on head CT that is concerning for abuse, then you do need to go forward and get an MRI of the brain without contrast.

This is to help us better evaluate that injury and help us better evaluate any parenchymal injuries and understand the mechanism a little bit better.

We also need to do an ophthalmology exam.

This only needs to happen.

If there's that intracranial blood that is also concerning for physical abuse. Looking for those retinal hemorrhages and then spinal injuries and MRI? Whole spine without contrast. Again, looking for occult injuries that we would not know are there.

Abusive head trauma is difficult to recognize.

It's important that it's on your differential.

That's the only way you're going to recognize it.

It's important to measure head circumference.

For those young children less than two years of age, head circumference is a vital sign that can give you valuable information.

Look at that growth charts. Asking about prior injuries and if we have prior injuries, does the mechanism in history make sense?

If not, it might prompt.

Evaluation, regardless of whether that child has injuries at that time.

One study looking at missed abusive head trauma showed that children who are white and in families with both parents present and present with minimal symptoms, such as that vomiting, that fussiness, that irritability were less likely to have their injury recognized and presented later, with worse injuries.

So this is one example of a tool that can a clinical prediction tool that could help you decide if you need to evaluate further.

So this is the Pittsburgh infant brain injury score.

And this shows great helps us to determine if we need neuro imaging.

So you need a score of two points to get neuro that to recommend neuroimaging.

So.

An abnormality and dermal logic exam.

So any kind of.

Bruises or injuries age greater than three months of age, head circumference greater than 85th percentile, and then a hemoglobin less than one, and two points recommends getting neuroimaging.

Now when we talk about abusive head trauma, some of you may have heard or read stories in the media that talks about a controversy and that there is medical disagreement as to the existence of abusive head trauma.

This controversy is not one that is within the medical field.

It is a controversy that is within the legal realm and is played out in the courtroom.

That is then.

Put out there by the media as having conflict within the medical community. By and large there not by and large there is no medical controversy as to the diagnosis of the existence of abusive head trauma.

The American Academy of Pediatrics has recently published a technical report that second paper on the bottom. There it is.

A 72 page.

Age report that reviews all of the data regarding our diagnosis of abusive head trauma.

It is a really, really great resource.

There's also the policy statement that was published in 2020 that talks about abusive head trauma also.

So these are some QR codes that links to to those papers.

I'm gonna just pause here for about.

15 seconds if if you guys wanted to.

Get access to those.

OK.

So some final thoughts about recognizing abusive injuries.

Think about where the injuries are.

What are the injuries?

So 10 four faces P for bruises. Thinking about the mechanism of the injuries, what had to happen to that body to cause the injury that you're seeing? What is the development of the child? Are there mobile?

Are they not?

Ambulatory, not ambulatory.

And does the history provided by the family, the spontaneous history provided by the family adequately explain this injury?

And if it doesn't, then you absolutely need to do that complete medical evaluation to find occult injuries and also to rule out any medical causes.

So this is our contact information at the Center for miracles.

That on call number is a child abuse pediatrician available 24/7 to answer any questions you have.

So if you're, you know, concerned, is this a Sentinel injury?

Do I need to do further work up? This is history.

Give a good mechanism. Please call us at any time.

We are here to help answer any questions that you have. That's it.



Kamat, Deepak M 54:37

Thank you Doctor Kushun, for that wonderful, wonderful presentation on recognizing child abuse. We already have a question in the chat bags chat box.

Can you discuss a little more the case of a father who was sentenced to death for a shaken baby syndrome in Texas?



Kisson, Natalie N 54:56

Yes, so.

That actually was not a that child. The mechanism for that child's death was blunt impact.

It was not shaking.

And so the media and others have conflated the two things together.

So they're in the public record is available. The transcripts for that child.

The court case and the injuries described are those from blunt impact.

And she, in addition to head injury, had many, many other cutaneous injuries, a blunt impact also that were abusive.



Kamat, Deepak M 55:42

Thank you.

Any other questions?

Comments for Doctor Christine.

Doctor Hanson wants to ask if you would like to share your slides.
She would like to post on the canvas for easy access for residents.



Kissoon, Natalie N 56:04

I can do.

What I'll do is I will take out some photos and things like that and I will make it into a PDF so it it'll be available and I can send it to you, Liz.



Kamat, Deepak M 56:15

Thank you.



Hanson, Elizabeth R 56:15

Thank you.

Thanks Natalie.

We had a case just very, very relevant to this last week.

Exactly. Almost like your first case in the R Ed initially.

Didn't pick up on the concern, so very timely.



Kamat, Deepak M 56:33

Any other questions, comments or thought to kissing?

I don't see any.

Thank you, doctor Christian, for that wonderful presentation.

Thank you all for attending this morning's grand round.

We'll have one more presentation on child abuse next Friday, so we'll we'll see you next Friday.

Same time same 30 AM CST.

Thank you all.

Thank you, Doctor Kristina.

Have a wonderful Friday and wonderful weekend. Thank you.



Kissoon, Natalie N 57:07

Thank you.

Thanks. Bye, bye.

● **Kamat, Deepak M** stopped transcription