Bruises, Dots and Spots
Deena Brecher RN, MSN
Clinical Nurse Specialist
Emergency Department

Objectives
- Describe the difference between petechiae and purpura
- Identify signs and symptoms of life threatening illnesses
- Identify three diseases that present with similar symptoms

Imagine this…
- You are working in a very busy emergency department
- All the beds are full, including hallway beds
- A dad walks into triage carrying his 8 year old son, who has his head buried in dad’s shoulder
- You immediately notice the patient has petechiae and purpura on both lower extremities
- What do you do?

A few assumptions…
- All pediatric patients who present to triage with petechiae and purpura should be assumed to be high risk
- NOT debating that
- Provide tools to enhance your decision making and assessment skills
- Let’s start with a few definitions…

Petechiae
- Minute 1-2mm hemorrhages in the skin or mucous membranes
- Usually associated with
  - Locally increased intravascular pressure
    - ie: blood pressure measurement
    - Tourniquet placement
  - Decreased platelets
    - Thrombocytopenia
  - Defective platelet function
    - Uremia
  - Clotting factor deficiencies

Where oh where are the dots?
- Distribution very important
- Face and neck
  - Seen in the presence of forceful coughing or vomiting
  - Very likely benign
- Above the nipple line
– Same as face and neck

**Wide distribution**
– With fever...highly suspicious of serious bacterial infection

**Purpura**
- **Greater than or equal to 3mm hemorrhage**
- **Causes include**
  – All of the causes for petechiae
  – Trauma
  – Local vascular inflammation
    - vasculitis
  – Increased vascular fragility
    - amyloidosis

**Is it a bruise or something worse...the blanch test**
- **Areas of erythema can be distinguished by whether or not they blanch**
  – Erythema is caused by increased blood flow to the area
    - Pressure will momentarily empty the vessels, causing the blanching
  – Petechiae and purpura caused by blood leaking into the tissue spaces
    - Pressure will not cause blanching

**Thrombocytes (platelets)**
- Disk shaped
- Necessary for clot formation
- Produced by megakaryocytes in the bone marrow
- Rate of production constant throughout life
- Life span 7 to 10 days
- Activated by damage to the blood vessel wall
- 150,000 to 400,000 mm$^3$ considered normal

**Thrombocytopenia**
- **Low platelet count that results from either**
  – Excessive destruction
  – Inadequate production
- **Platelet count less than 100,000 mm$^3$**
- **Spontaneous bleeding occurs when platelet count is less than 20,000 mm$^3$**

**Inadequate Production**
- **Bone marrow failure**
  – Aplastic anemia
- **Bone marrow replacement**
- **Congenital amegakaryocytosis**
- Bone marrow suppression
  - Chemotherapy
  - Radiotherapy

**Excessive Destruction**
- Idiopathic thrombocytopenia (ITP)
- Disseminated intravascular coagulation (DIC)
- Thrombotic thrombocytopenia (TTP)
- Collagen vascular diseases
- Hemolytic-uremia syndrome (HUS)
- Toxins
- Drugs

**Differential Diagnosis of a Child Who Presents With Petechiae Or Purpura**
- Meningococcemia
- HSP
- Idiopathic Thrombocytopenia
- Rocky Mountain Spotted Fever
- Leukemia

**Meningococcemia**
- A rapidly progressing sepsis that may or may not involve meningitis
- Causative organism
  - Neisseria meningiditis
  - Gram negative diplococcus
- Incidence
  - As high as 7-11% in children with petechiae and fever

- May begin as a nonspecific febrile illness
- Rapid progression to multisystem organ failure and death if not quickly recognized and treated appropriately
- Most deaths occur within the first 48 hours of illness
- Fatality rates as high as 50%

**Symptoms of Meningococcemia**
- Initial nonspecific symptoms include
  - Fever
  - Headache
  - Myalgia
Abdominal pain
- Rash may also progress rapidly
  - Starts as macular, maculopapular or urticarial
  - Becomes petechiae and purpura
- Initial symptoms followed by signs of compensated and then uncompensated shock

Clinical Predictors of Poor Outcomes
- Young age
- Temperature less than 38°C
- Presence of coma on presentation
- Hypotension
- Leukopenia
- Thrombocytopenia
- Absence of meningitis

Workup and Treatment
- Consider meningococcemia in all children who present to the ED with fever and petechiae
- All ill appearing patients with petechiae and or purpura – assume and treat for overwhelming meningococcemia
- Blood cultures needed for definitive diagnosis, however DO NOT DELAY antibiotic administration
- PCR testing also helpful if possible
- CBC, CMP, PT/PTT, d-dimer

Henoch-Schönlein purpura (HSP)
- AKA
  - Allergic vasculitis
  - Allergic purpura
  - Anaphylactoid purpura
  - That disease with a German name
- Etiology unknown though often follows an upper respiratory infection
- Most frequently occurs in children ages 2 years to 11 years.
- Boys affected twice as often as girls

Pathophysiology
- Multi-system disorder
- Characterized by inflammation of small blood vessels
- The manifestations observed are influenced by the size and distribution of the affected vessels
- Extravasation of the red blood cells cause petechial lesions
- Involves the skin kidneys, GI tract, and central nervous system

Clinical Manifestations
- Primary feature
  - Symmetric purpura that involves buttocks and lower extremities
  - May also extend to include the extensor surfaces of the upper extremities
  - Infrequently see lesions on face and upper trunk as well
- Nonmigratory polyarthralgia
- Colicky abdominal pain
- Renal involvement

Diagnostic Workup and Treatment
- Rule out abdominal pathology
- Evaluate renal function
  - Check urine for protein and blood
- Based on clinical findings
- Normal CBC
- Normal platelets and complement level

Idiopathic Thrombocytopenic Purpura
- Idiopathic – cause unknown
- Thrombocytopenia – destruction of platelets
- Purpura - >3mm hemorrhages under the skin
- Believed to be an autoimmune response to disease related antigens
- Most frequently occurring thrombocytopenia of childhood
- Incidence of 4 in 100,000 children

Acute vs. Chronic ITP
- Acute form
  - Most commonly seen after
    - URI
    - Childhood diseases
  - Self limiting
  - Hemorrhagic phase lasts 1-2 weeks with resolution by 6-12 months
- Chronic ITP
  - Affects females greater than 10yrs most commonly
  - Usually associated with another immunologic dysfunction
    - Lupus
    - IgA deficiency
    - Malignancy

Clinical Manifestations
- Easy bruising
  - With petechiae
- Over bony prominences
- **Bleeding from mucous membranes**
  - Epistaxis
  - Bleeding bums
  - Internal hemorrhage
- **Hematomas on lower extremities**

### ED Treatment
- Assess for and treat shock
- Anticipate and facilitate lab studies
  - CBC with diff and platelets
  - Platelets less than 20,000/mm³
- **Most of the time care is supportive**

### Discharge instructions should include:
- Direction for the parents to observe for
  - Bloody stools
  - Abdominal distention
  - CNS changes
- Avoid medications that can affect platelets
  - Aspirin, ibuprofen, guaifenesin
- **No contact sports**
- Follow up with hematologist

### Rocky Mountain Spotted Fever
- Let’s start with a bit of history…
- First tick-borne infestation in North America to be recognized
  - Discovered in 1908
  - American pathologist Howard T. Ricketts
- **Rickettsia rickettsii**

### Epidemiology
- **Occurs throughout**
  - North America
    - United States, Canada and Mexico
  - Central America
    - Costa Rica, Panama
  - South America
    - Bolivia, Brazil, and Columbia
- **Varies widely by geographic region**
  - Prevalent in North and South Carolina, Virginia, Oklahoma, Arkansas, and Tennessee
Incidence
- 1997-2002 in the United States
  - Estimated to be 2.2 cases per million persons
- Incidence varies greatly from year to year
- Actual incidence may be greater than surveillance data suggests
- Highest in late spring and early summer
- Groups most often affected
  - Children less than 10 years of age
  - Men
  - Caucasians
- Fatalities and severe disease most often seen
  - Patients greater than 40 years of age
  - African Americans

Transmission
- Humans are “accidental” hosts of R rickettsii
- Role of domesticated animals
- Three different vectors
  - American dog tick (Dermacentor variabilis)
  - Rocky Mountain wood tick (Dermacentor andersoni)
  - Brown dog tick (Rhipicephalus sanguineus)
- Infection has also been associated with
  - Tick removal
  - Contact with infected tissue
  - Blood transfusions
  - Needle stick injuries

Clinical Features
- Variable incubation period
  - 2 days to 2 weeks
- Early phase of illness
  - Nonspecific symptoms
    - Fever, malaise, aching, chills and headache
    - May mimic many other viral and bacterial illnesses
  - These symptoms rarely lead to correct diagnosis
  - Up to 40% of patients do not recall being bitten by a tick
    - Painless
    - Location
- Classic clinical triad
  - Fever
  - Headache
  - Rash
- Less than 5% of patients experience this within the first 3 days of illness
- 60-70% have these symptoms by the second week of exposure

- **Fever**
  - Almost always present
  - Often greater than 38.9°C (102°F)

- **Headache**
  - Most often present in adult patients
  - Typically severe

- **Additional symptoms**
  - Myalgias
  - Generalized malaise
  - Anorexia

**Rash of RMSF**
- Variable in presentation
- Often absent in the early phase of disease
- Most develop between day 3 and day 5
- Begins as blanching and nonpruritic macular rash
- Progresses to papular
- Petechiae may also occur

**Classic RMSF Rash**
- Centripetal progression
- Starts on wrists and ankles
  - Blanching macules
  - Spreads centrally to arms, legs, trunk and face
  - Evolves to nonblanching petechiae and purpura
  - Can involve palms of hands and soles of feet
- May be absent in up to 20% of cases

**Diagnosis**
- Unpredictability of symptoms can make diagnosis difficult
- Based upon probability that clinical features can represent RMSF in the correct setting
- Should be included in differential dx when
  - Pt is acutely ill with fever
  - Resides in endemic region
- Often confused with several different diagnoses

**Laboratory Findings Consistent With RMSF**
- Hyponatremia
  - Up to half of all cases
- **Thrombocytopenia**
  - Occurs in most patients
  - Result of platelet sequestration and destruction in microcirculation
  - Can be a critical clue
- **May also see**
  - Elevated liver enzymes
  - CSF pleocytosis
- **Serological testing**

**Treatment**
- Based solely on clinical suspicion
- Therapy MUST be started before laboratory confirmation is obtained
- **Drug of choice**
  - Doxycycline
  - 2mg/kg per dose up to 100mg per dose twice daily
  - Treat for 7-10 days or until fever free for three days

**Clinical Outcome**
- Overall case fatality rate as high as 7%
- Higher risk for adverse outcome
  - Pre-existing G6PD deficiency
  - Males and those greater than 40 years of age
  - Lab evidence of renal or hepatic impairment
  - Children under 4 years of age
- **Patients who receive prompt antibiotic therapy have better outcomes**
- **Can experience some long-term sequelae**
  - Hearing loss, paraparesis, motor, vestibular and cerebellar dysfunction

**Childhood Leukemia**
- Approximately 3250 new cases diagnoses annually in the United States
- Acute leukemias account for about 30% of all malignancies in children less than 15 years of age
- Believed to arise from genetic alterations in hematopoietic progenitor cells
- **Classified as one of three different types**
  - Acute lymphoblastic leukemia
  - Acute myeloid leukemia
  - Chronic myeloid leukemia

**Acute Lymphoblastic Leukemia**
- Accounts for about 80% of new cases each year
- Sharp peak in incidence among 2-3 year olds
- Survival rate approximately 75-80%
- 3 major subtypes
  - B-precursor (70-80% of patients)
  - Mature B cell (2-5% of patients)
  - T cell (15% of patients)

**Acute and Chronic Myeloid Leukemia**
- AML accounts for about 20% of new cases per year (800-900 cases)
- CML accounts for 1% of new cases per year
- Rates are highest in the first 2 years of life
  - Decrease at around 9 years of age
  - Slowly increase again during adolescence
- 50-60% achieve long term survival

**Prognostic Features in Childhood Leukemia**
- ALL
  - **Favorable**
    - > 1 or < 10 years old
    - WBC < 50,000
    - B-precursor
  - **Unfavorable**
    - < 1yr or > 10 yrs old
    - WBC > 50,000
    - T-cell

**Diagnosis**
- **Classic Presentation**
  - Symptoms of pancytopenia
    - Pallor and fatigue
  - Ecchymoses
  - Petechiae due to thrombocytopenia
    - 75% have platelet count < 100,000/uL at diagnosis
  - White Blood Cell count
    - May be elevated (>50,000/uL in 20%)
    - More commonly low (<10,000 in 50%)
  - Lymphadenopathy
  - Bone pain

**Additional Signs and Symptoms**
- Significant infection or overwhelming sepsis
  - Seen in patients who are neutropenic
- **Cough or other respiratory symptoms**
  - Associated with mediastinal masses
  - Usually associated with T-cell ALL
- **Headache or cranial nerve abnormalities**
  - Leukemia within the CNS
- Uncommon presentations
  - Isolated testicular mass (ALL)
  - Soft-tissue mass (AML)

**Not always an acute presentation**
- Presenting signs and symptoms may be subtle
- Develop over weeks to months
- Often begin with fatigue and decreased energy
- May develop persistent or intermittent fevers
- Unexplained lymphadenopathy or hepatosplenomegaly on exam
- Diagnosis may take weeks or months

**Evaluation**
- CBC
- Chemistry panel
  - Hepatic or renal dysfunction
  - Tumor lysis syndrome
    - Elevated uric acid, K+, phosphate
- PT/PTT
- CXR
- Physical exam for signs of infection
- Bone marrow aspiration required for definitive diagnosis

**Treatment**
- Vast majority treated as part of a clinical trial
- Treatment based upon type of leukemia, age of patient and presenting symptoms
- Usually lasts between 24-36 months
- Divided into treatment phases
  - Remission induction
  - Consolidation and delayed intensification
  - Maintenance

**Ok...So Now What?**
- How does all of this help me?
- What are the “signs” that will point me in the right direction?
- Are there any good questions to ask?

**The Nurse Detective**
- Remember that pediatric patients are great “little fakers”
  - They compensate well
  - Early signs of trouble are subtle and easy to miss
- **Assess your patient first**
  - If sepsis is likely, treat your patient as if they had meningococcemia
– Treat the worst, hope for the best

- Patients who have leukemia have more than one cell line affected
  – Children with petechiae and PALLOR
  – Thrombocytopenia and ANEMIA
- Patients with HSP will more than likely have purpura to DEPENDENT areas
  – Legs, buttocks, arms
  – Absent above the waist
- ITP impacts platelets only
  – Petechiae and/or purpura with NORMAL skin color

Questions to Guide Your History Taking
- How long have symptoms been present?
  – Short duration – think infection
  – Longer duration – think noninfectious cause
- Exposure?
  – Tick bites
  – Others in the home sick?
- How did the rash develop?
  – Wrists and ankles towards center
  – Legs, buttocks, arms
  – Bruises and petechiae

Let’s review our patient
- Your patient presents with petechiae and purpura to lower extremities
- What history do you want to obtain?
- What do you want to include in your physical exam?
- This patient likely has...

In summary
- Children who present with petechiae and purpura range from the not so sick to the very sick
- Always assume the worst when evaluating and treating your patient
- Good assessment skills can help differentiate between several different diagnoses
- Honing these skills provides the nurse the skills they need to anticipate complications and prepare patients and families for the road ahead

Questions?
References