

## Exploring a Pediatric Exanthem

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### Introducing Morning Report

Morning Report is a traditional round in most internal medicine training programmes. While the specific format of Morning Report varies between institutions, it typically involves the presentation of a clinical case followed by a case-oriented discussion. At the University of Toronto, the goals of Morning Report are to facilitate teaching and learning at various levels of medical training, to promote social interaction between the medical faculty and the medical housestaff, and to discuss issues related to local hospital structure and function. Traditionally, the medical team that was on-call the night prior to Morning Report presents a clinical case from the previous day's admissions. A staff physician then leads a discussion of the case with the goal of emphasizing the clinical reasoning process involved in the diagnosis and management of the patient's condition. Discussion focuses on the generation of a provisional and differential diagnosis for the presenting complaint, refinement of the provisional diagnosis as additional information becomes available, the anticipation of laboratory and radiological findings, and principles of management of the condition.

### The Scene

A conference room in a Toronto teaching hospital. Students, residents and staff physicians are seated around a large table. Jonathan, a third year medical student, and Jessica, a second year resident (PGY-2), have worked overnight admitting patients to the hospital. They have selected one case from the previous night's admissions, which they will now present to the group. A faculty member, Dr. Chang will facilitate a discussion of the case.

Jonathan: This 10-month-old girl presented to the emergency room because of a fever and a rash. The fever started approximately one week ago and was documented by the parents at 40°C, measured rectally. She became irritable, ate poorly, and had a nonproductive cough, and coryza. The maculopapular rash started about 4 days ago in the groin area but soon became generalized. She presented to her family doctor 3 days ago, when she was given erythromycin and acetaminophen.

Although the rash has begun to clear (see Figure 1), the temperature still ranges between 38.6°C and 40.8°C.



Figure 1. Photograph of hand showing a maculopapular rash.

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- Dr. Chang: Fevers and rashes are fairly common occurrences in the pediatric population. What is the differential diagnosis for an infant with a febrile exanthem?
- Jonathan: The commonest pediatric exanthem is chicken pox, but one must also consider the nature of the exanthem. With a maculopapular rash, measles, rubella, roseola, scarlet fever, and Kawasaki's syndrome are clear possibilities. Staphylococcal scalded skin syndrome or meningococemia would be considerations if the rash were bullous or petechial.
- Dr. Chang: Excellent, those are some of the classic pediatric exanthems. But clinically, one must also consider other origins of the exanthem such as drug reactions, allergic reactions, and signs of systemic disease such as juvenile rheumatoid arthritis. Let's continue with the history in order to try and narrow down our differential diagnosis.
- Jonathan: The girl and her older brother had chicken pox two months ago. One month ago she had an episode of a mild fever and a scarlet fever-like rash. The mild fever and rash resolved within a few days of onset but the skin on her arms and legs began to peel. The girl's immunizations were up to date, she was on no other medications, and there was no history of travel or exposure to sick persons, or animals. There was no family history of allergy. The pregnancy and delivery were uncomplicated.
- Jessica: So this exanthem is likely not due to chicken pox. The mild fever and rash one month ago may lead us to think of something more chronic rather than acute or they could be unrelated. The immunizations were up to date, but the MMR vaccine is not given until 1 year of age. The lack of exposure to sick persons or animals makes infectious causes slightly less likely. An allergic or drug reaction to erythromycin is not likely as the rash started before the erythromycin was given. As well, there was no evidence of congenital or chronic disease. We also forgot to point out that the mother mentioned she thought that the baby's lips were swollen and the tongue was redder than usual.
- Dr. Chang: That is a very important point because it starts to make us focus on certain diagnoses. Jonathan, do you know what we are thinking about?
- Jonathan: Considering the rash I think that the glossitis makes one think about Kawasaki's or...anemia?
- Jessica: I think that glossitis associated with macrocytic anemia sounds more unlikely given the clinical picture. With pediatric exanthems and glossitis, the important distinction to make is between Kawasaki's syndrome and scarlet fever.
- Dr. Chang: What are the diagnostic criteria for Kawasaki's syndrome?
- Jonathan: The diagnostic criteria comprise fever of at least five days' duration and four of the following five findings:
1. Bilateral non-purulent conjunctivitis
  2. Oral changes (strawberry tongue, oropharyngeal redness and lip cracking)
  3. Cervical lymphadenopathy, usually unilateral
  4. Redness of palms/soles, edema of fingers/toes and desquamation of fingers/toes during convalescence
  5. Polymorphous erythematous rash, often with perineal accentuation
- Dr. Chang: Excellent. Now tell me about the prognosis and treatment of Kawasaki's syndrome.
- Jonathan: The main complication of Kawasaki's syndrome is the development of coronary artery aneurysms that occur in almost a quarter of untreated patients. These may lead to sudden death. The treatment involves a single high dose of intravenous immunoglobulin and long-term administration of aspirin.
- Dr. Chang: What about scarlet fever?
- Jessica: Scarlet fever is caused by group A streptococci. It is characterized by an incubation period of two to four days followed by fever, headache and tonsillitis. A macular rash develops with increased density in the neck, axillae, and groin. Desquamation occurs on the hands and feet and tends to be fine flaking of the skin but may peel in sheets. A thick white coating develops on the tongue that eventually peels and reveals a strawberry tongue.

Dr. Chang: So tell me about the physical exam.

Jessica: Her temperature was 39.7°C, her pulse was 120, respirations were 46 and her blood pressure was 115/65. Examination revealed a diffuse erythematous rash with desquamation on the legs, toes and fingers with cervical, axillary and inguinal lymphadenopathy. The conjunctivae were injected, there was swelling, redness and cracking of her lips, and the tongue and pharynx were reddened. The otoscopic and ophthalmoscopic examinations were normal. The lungs were clear and the heart was normal.

Dr. Chang: So do you think that this infant has Kawasaki's syndrome or scarlet fever?

Jonathan: Her fever, rash, conjunctivitis and oral changes are supportive of the diagnosis of Kawasaki's syndrome. However, the locations of the desquamation are atypical and the lymphadenopathy is diffuse and not confined to the cervical area. The desquamation in this case is more typical of scarlet fever. However, no evidence of tonsillitis was found and a thick white coating on the tongue was never noticed.

Dr. Chang: So in this case we are really not very sure if this is scarlet fever, Kawasaki's syndrome, or something else. So tell me about the lab work, investigations and tests.

Jonathan: The urine was mildly positive for protein and for ketones. The sediment contained no red cells, 3 to 4 white cells and a few bacteria per high-power field. Urine, blood and throat cultures were taken. Laboratory tests were performed (Table 1). Radiographs of the chest revealed pneumonia in the right upper lobe with a small pleural effusion (Figure 2). The oxygen saturation was 99% on room air.

Jessica: The severity of this child's fever, its lack of response to antimicrobial agents, and the pulmonary infiltrate raise the possibility of tuberculosis. A careful history of the family, which had emigrated from Haiti, revealed that the father might have been exposed to tuberculosis many years ago and might have received treatment with isoniazid.

Dr. Chang: So what do we want to do if we suspect tuberculosis?

**Table 1**  
**Laboratory Findings**

Hematocrit	33%	Differential (%)	
MCV ( $\mu\text{m}^3$ )	75		
ESR (mm/hr)	81	Neutrophils	55
Smear Results	hypochromia (+) microcytosis (++)	Lymphocytes	35
WBC (per $\text{mm}^3$ )	20 600	Monocytes	9
Platelets (per $\text{mm}^3$ )	614 000	Eosinophils	1
AST (U/liter)	24		
Alk phos (U/liter)	119		

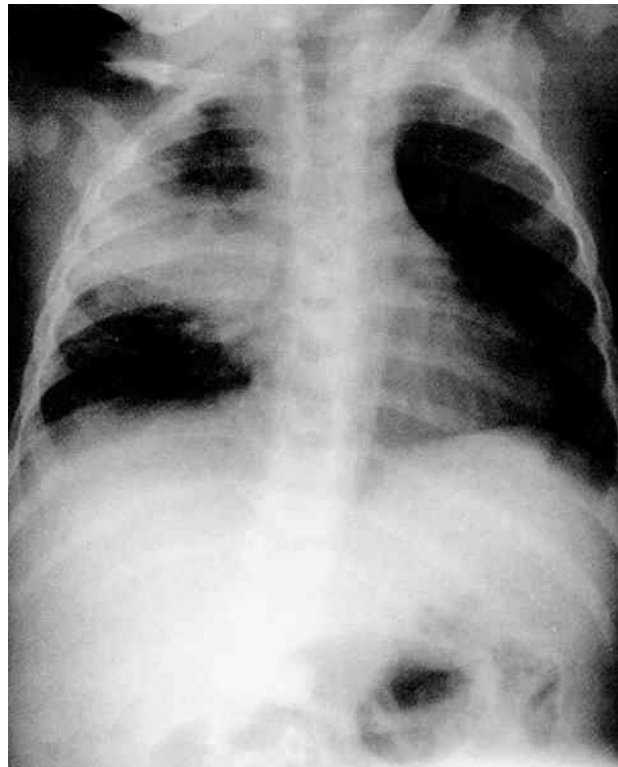


Figure 2. Chest radiograph showing dense consolidation in the right upper lobe and hilum with an adjacent pleural effusion.

Jonathan: In considering tuberculosis, in addition to the chest radiograph, we would want to perform a tuberculin skin test, obtain sputum samples and perhaps perform a thoracentesis in order to obtain fluid from her pleural effusion.

Dr. Chang: Sputum samples?

Jessica: I think that Jonathan is referring to aspiration of gastric contents while the child is fasting or bronchoalveolar lavage because infants cannot expectorate sputum.

Jonathan: Yes...we also found some very interesting papers in our Medline search which indicate a high rate of false-positive tuberculin tests in both typical cases of Kawasaki's syndrome and streptococcal infection.

Dr. Chang: Okay, so that may confound the results of our skin test. Are there any other symptoms here that may make it difficult to diagnose tuberculosis?

Jessica: The cutaneous findings in this child are difficult to attribute to tuberculosis. The characteristic skin manifestations of tuberculosis are erythema nodosum and tuberculids which are the result of disseminated infection. Our Medline search revealed no previous case reports noting an association between tuberculosis and a diffuse erythematous rash with subsequent desquamation.

Dr. Chang: So tell me what you think is happening here.

Jonathan: We see three main possibilities. Kawasaki's syndrome, group A streptococcal infection, or tuberculosis.

Jessica: If we are considering Kawasaki's, the pneumonia must be considered bacterial in origin – probably pneumococcal or staphylococcal. If we attribute the symptoms to streptococcus, then we must question the lack of response to antibiotic therapy. If this child has pulmonary tuberculosis, we would need a second explanation - either Kawasaki's syndrome or streptococcal infection - in order to explain the rash and mucosal abnormalities.

Dr. Chang: So what do you suggest we do?

Jessica: In terms of investigations, I would suggest an echocardiogram in order to look for evidence of coronary artery aneurysms consistent with Kawasaki's syndrome. We are also waiting for the blood, urine and throat culture results. We must also wait to see the results of the tuberculosis investigations. In the meantime, the duration of this child's fever, the relatively high frequency of atypical Kawasaki's syndrome in infants, the low toxicity of therapy, and the importance of preventing coronary artery aneurysms would warrant the administration of immunoglobulin and aspirin.

Dr. Chang: That sounds like a reasonable idea. Thank you for presenting this case.

## Follow-up

Gastric aspiration and fluid from the pleural effusion did not provide any acid-fast bacilli on smear or culture. However, the bronchoalveolar lavage provided material showing beaded acid-fast bacilli, which proved to be *Mycobacterium tuberculosis* on culture. The infant was discharged while receiving isoniazid, rifampin, pyrazinamide and ethambutol and she is now clinically well.

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## Clinical Pearls

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1. It is always important to search thoroughly for systemic symptoms and signs when considering the etiology of a rash.
2. When suspecting Kawasaki's syndrome in infants, the low toxicity of therapy and the importance of preventing coronary artery aneurysms would warrant the early administration of immunoglobulin and aspirin.
3. With increasing prevalence of tuberculosis and a larger number of immigrants from poorer countries, it is important to maintain a high index of suspicion for tuberculosis.

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## Acknowledgements

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