Answers to photo opportunity talk for 2022

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1. Nocardia nova

Nocardiosis is an important cause of acute pneumonia in immunosuppressed patients and may cause lung abscess or disseminate to the brain, causing brain abscess. Patients with pulmonary alveolar proteinosis are also at risk of nocardiosis. Nocardia are branching Gram positive bacilli that can be seen on Gram stain and stain positive with modified acid-fast stains. They grow readily on routine media but are not visible in the 2 or 3 days that routine sputum cultures are incubated. Growth on mycobacterial culture medium may be inhibited during the routine processing of sputum for mycobacterial culture. Culture for Nocardia should be requested.

The only other branching Gram-positive rod in the list of answers in Actinomyces neuii, which causes actinomycosis. Two weeks of symptoms is far too short for actinomycosis to cause such extensive infiltrate and hematogenous spread to the skin would be extremely unlikely.

2. Actinomycosis

Actinomycosis should be suspected when an indolent infection spreads across tissue planes, such as penetrating to the skin from the lung as in this case, or from the colon or liver in other cases. . The small yellows grain in the pus are called “sulfur granules” because of their yellow color. Grains in pus are characteristic of actinomycosis and mycetoma, a chronic subcutaneous infection. All the Actinomyces species causing actinomycosis are normal flora in the oropharynx and colon. Infection begins in the mouth, lung, or GI tract. Rarely, women with a copper IUD will develop pelvic actinomycosis. Treatment for several months is usually needed for pulmonary or abdominal infection to prevent relapse.

3. Gram positive bacillus

Erysipelothrix rhusiopathiae is a pleomorphic, gram-positive bacillus capable of causing self-limited soft tissue infection called erysipeloid or serious systemic infection. E. rhusiopathiae is widespread in nature, occurring in domestic and marine animals including cattle, chickens, crabs, and fish. Crab pickers are classic, but swine farmers may be more common.

Infection in humans is usually due to occupational exposure. Thus, slaughterhouse workers, butchers, fishermen, farmers, and veterinarians are at risk.

The typical manifestations are localized or diffuse skin lesions, or bacteremia.
Bacteremia is often accompanied by endocarditis.

Aeromonas, a Gram-negative rod, would cause a more acute erythematous lesion. Vibrio vulnificus, a curved Gram-negative rod, can cause severe bullous soft tissue lesions on exposure to brackish water by persons with advanced liver disease or immunosuppression but lesions are acute and rapidly progressive. Staphylococcus aureus, a Gram-positive coccus, can cause cellulitis but that would be more erythematous and acute. Campylobacteria are seagull-shaped but don’t cause skin lesions.

4. Plague

High fever, a local lesion and a tender swollen lymph node (bubo) with prostration suggests plague, tularemia or a staphylococcal abscess, the latter two not being on the list above. Staphylococcal furuncles would have been more indolent.

Eikenella and Pasteurella multocida typically do not give a bubo, though they may cause sepsis from a dog or cat bite.

Spirillum minus is a rare disease from rat bites in Japan. This is not seen in the US.

Streptobacillus also causes rat bite fever, without a bubo but often with rash and arthritis.

Plague is important to diagnose because the best drug is streptomycin or gentamicin, not something typically used for skin and lymphatic infection. This child presumably was bitten on the abdomen by a flea from a rat, developed the abdominal lesion, and then the bubo.

5. Lemierres: anaerobic Gram-negative rod

This patient has Lemierre's syndrome, usually due to Fusobacterium necrophorum, causing a syndrome consisting of suppurative phlebitis of the internal jugular vein, as shown by the clot partially obstructing the internal jugular vein, and a lung nodule due toa septic embolus. Lemierre's begins with a sore throat with high fever. Infection extends from the tonsillar area to the internal jugular vein, causing septic phlebitis, bacteremia and septic emboli to the lung, sometimes followed by empyema.

The organism is almost always a Fusobacterium species, all anaerobic Gram-negative rods, usually Fusobacterium necrophorum. Most Fusobacterium isolates are susceptible to beta-lactams, metronidazole and clindamycin.

Not all patients have swelling in the anterior cervical triangle, as did this patient, and in some the pharyngitis will begin to respond to antimicrobial therapy while the septic phlebitis is progressing.

Peritonsillar abscess may be seen on imaging of some patients.

6. Coccidioidomycosis

The spherule indicates the diagnosis of coccidioidomycosis. African Americans are a much higher risk of dissemination than Caucasians.

Sites of dissemination prominently include bone, joint, soft tissue, meninges and skin, though other organs may be affected. The source of infection is inhalation from the soil.

Coccidioides spores are extremely resistant to desiccation and heat of summer in the Southwest United States. Arizona has the highest attack rate of coccidioidomycosis, with California coming in second. Tucson is in a highly endemic area.

7. M chel0nae

Mycobacterium chelonae infection has been a complication of cosmetic surgery, most often when done overseas. This water-borne organism can be introduced from markers placed on the patient's skin by the surgeon or from contamination of the implanted material. Tender nodules develop much more gradually than common bacterial infections. Nocardia species exist in dirt; agents of phaeohyphomycosis exist in plant debris. Neither is likely to contaminate both operative sites. Botryomycosis results from chronic bacterial infections and would have begun much earlier postoperatively. Idiopathic nodular panniculitis would not be confined to the operative sites.

8. Crusted scabies

This is crusted scabies, also known as Norwegian scabies (the term "Norwegian" refers to the fact that the syndrome was first described in Norway-there is nothing different about the vector of the usual form and the Norwegian form---it's the host response which differs). The etiologic agent is Sarcoptes scabiei var. hominis. Diagnosis is made by microscopic examination of skin scrapings. The Sarcoptes scabiei and their feces are abundant in the lesions.

This is easily transmitted person to person, including from the patient to medical personnel. This severe form of scabies can be seen in HIV infection, but also look for this in any immunosuppressed patient, i.e., leukemia or lymphoma, organ transplantation, or patients treated with high dose corticosteroids. The treatments of choice are topical permethrin 5% or oral ivermectin

Although this man may have HIV infection, HIV infection itself would not explain the lesions. Skin lesions of secondary syphilis are always a consideration, but are not typically pruritic and hyperkeratotic. Acid fast organisms, such as Mycobacterium marinum and Mycobacterium chelonae are never hyperkeratotic, like the lesions shown. Fungal culture might be useful if this were ringworm but the extent of crusting shown here is unusual for ringworm, as is the multiple locations of lesions.

9. Strongyloidiasis

Seeing larvae is stool is characteristic of strongyloidiasis because the eggs excreted by the worms turn into larvae before the intestinal contents are defecated. Also, this patient has eosinophilia. Strongyloidiasis should be considered in patients with persistent eosinophilia. Infection is acquired by exposure of intact skin to water contaminated by urine or feces from infected animals or humans. Infection can persist silently for decades because of autoinfection. Diagnosis is made by finding larvae in stool but the smear for ova and parasites is relatively insensitive. Three stools for O&P are recommended. IgG antibody can be used to detect persons at risk but is not the preferred diagnostic test. Oral ivermectin is the preferred therapy.

10. Herpes simplex

I keep including this photo in my presentations year after year because the audience keeps getting it wrong. The important point is that herpes simplex can spread on the body surface from a lesion in the mucosa, such as the mouth or vagina. That kind a spread is seen in wrestlers, called herpes gladiatorium, or in patients with eczema or other skin diseases., called Kaposi's varicelliform eruption or eczema herpeticum. This patient's herpes simplex spread along here back while she lay febrile, sweating in bed for many days, possibly originating in a genital lesion that was no longer apparent. Herpes zoster does not spread by inoculation into an abraded or chronically moistened skin. Herpes zoster very rarely is bilateral. The lesion is too extensive and superficial for an angioinvasive bacterial or fungal infection.

11. Ehrlichiosis

This is a morula in a monocyte, indicative of ehrlichiosis. Ehrlichiosis is transmitted by ticks. Note that the morula is in a monocyte, not a neutrophil, which would indicate anaplasmosis, spread by a deer tick..

12. Paraccodioidomycosis

The photo shows a facial lesion and a budding yeast, so a spirochete (yaws) and a Gram negative bacillus (rhinoscleroma) cannot be correct. Rhinosporidiosis causes discrete, often pedunculated, lesions in the oropharynx, nose or conjunctiva and the stuctures don't bud. Leishmania amastigotes do not bud. Distinction from mucosal leishmaniasis is important because the clinical picture can overlap. Paracoccidioides brasiliensis often presents in male agricultural workers over the age of 30 as a small number of lesions in the skin or mucosa, often the mouth or face. Treponema pallidum pertenue causes yaws, which are crusted lesions on exposed areas of skin. Mucosa is not involved.

13. Molluscum contagiosum

This is Molluscum contagiosum, which is caused by a pox virus that is spread by skin to skin contact.

These lesions can become numerous and large in patients with HIV infection, especially those with low CD4 counts.

There is no specific chemotherapy.

The lesions often resolve with ART, or can be removed by physical methods such as liquid nitrogen, curretage, or electrosurgery although such therapies may have to be repeated every few weeks for lesions that are cosmetically disturbing.

Some reports suggest a role for cidofovir, but that is controversial and was not offered as an option.

Disseminated cryptococcoccal infection can cause skin lesions that look like molluscum, but the patient would typically be ill with persistent fever

14. Echinococcosis

A relatively asympomatic cystic liver lesion should suggest the diagnois of echincoccossis, also called hydatid disease. This patient acquired echinococcosis from incidental ingestion of stool from dogs who have eaten uncooked meat from sheep infected with Echinococcus granulosus. Cysts are often single, in the lung or liver, and asymptomatic as they enlarge over several years.

Echinococcus species are widely distributed worldwide as a tapeworm (taenia) of carnivores.

Echinococcus multilocularis (alveolar echinococcosis) also causes liver lesions but these are not cystic. On CT imaging they more resemble a tumor than a cluster of cysts. Alveolar echinococcus is found worldwide, including in Alaskan natives with dogs fed bear or other animal meat.

15. Tuberculoid leprosy

Vitiligo should always raise the question of tuberculoid leprosy in patients raised in an endemic area. Hypesthesia can often be demonstrated but biopsy is required for diagnosis. Tuberculoid leprosy may have small numbers of bacilli on biopsy. This may require repeat stained sections stained for acid fast bacilli or, occasionally, PCR to detect M. leprae.

A skin scraping would be ideal is this were tinea versicolor, which can cause patches of vitiligo. Malassezia furfur, which causes tinea versicolor, causes slightly hypopigmented plaques over body, particularly the cape areas of the body but not in this limited distribution and the patches would not be

numb. As skin scraping could be good for ringworm or erythrasma but these lesions are too flat for ringworm and neither causes lesions which are numb. A silver stain for fungi or mycobacteria might be useful if these lesions were not so macular. Of course, Mycobacterium leprae does not grow in culture.

16. Necrotizing fasciitis

This patient should be considered to have streptococcal necrotizing fasciitis until proven otherwise and emergency surgical consultation obtained. Necrotizing fasciitis can spread rapidly, causing morbidity and death.

The location, normal host, severe pain and rapid progression would make Meleney's gangrene with mixed anaerobes and aerobes less likely.

Clostridum perfringens, causing gas gangrene, usually follows major trauma or occurs in poorly vascularized tissue and has gas in the tissue.

Staphylococcal pyomyositis is a rare cause of this clinical picture in the calf and is most often mistaken for deep venous thrombosis. Patients in the United States with Staphylococcal pyomyositis often have comorbid conditions, and pain is less intense or progression slower. Imaging is often helpful in distinguishing causes in patients like this but should not delay surgical consultation. You don't want the patient to be In radiology when the surgeons come by for initial consultation.

Vibrio species can cause significant soft tissue destruction with high mortality but on the exam, there must be information about exposure (wading in brackish water or eating shell fish) and a predisposing host factor such as cirrhosis.

17. Trypanosomiasis

The structure shows the bloodstream phase of African trypanosomiasis, most likely Trypanosoma brucei rhodesiense, the agent of East African trypanosomiasis, also called sleeping sickness because of the encephalitis the infection produces. The vector is the tsetse fly. The flagellated structure in the photomicrograph is similar to West African trypanosomiasis, also acquired from a tsetse fly bite, but the blood smear is less often positive in that infection. Chagas disease is also caused by a trypanosome but occurs in the Americas, particularly South America, and is rarely seen in the blood smear.

18. Onchocerciasis

The patient has Onchocerca volvulus infection, acquired from a fly bite and is at risk of keratitits. Patients with onchocerciasis have a skin nodule that contain macroscopic adult filariae which release microfilariae that then migrate through the skin, which can cause intense itching. The accompanying image demonstrates microfilariae that have emanated from adult worms in the nodule. Unlike this temporary resident with a single nodule, multiple subcutaneous nodules are usual in long-term African residents. A serious complication of prolonged and intense microfilaria migration throughout the body is sclerosing keratitis, giving onchocerciasis its other name, river blindness. This occurs due to repeated inflammation against dying microfilariae as they cross the cornea. While initially causing punctate keratitis, over time the small scars coalesce causing sclerosing keratitis and blindness.

Onchocerciasis is a rare cause of encephalitis.

These firm subcutaneous nodules of onchocerciasis should not be confused with the evanescent subcutaneous swellings (Calabar swellings) of loaiasis. Filaria are difficult to demonstrate in Calabar swellings. Loaiasis can be accompanied by adult filarial worms migrating through the conjunctiva but keratitis does not result from Loa loa infection. Thus, this is quite different from onchocerciasis.

Lymphatic (Bancroftian and Malayan) filariasis leads to lymphedema but does not cause subcutaneous nodules. Bancroftian filariasis can cause tropical pulmonary eosinophilia, associated with coughing and wheezing, but not pruritus or skin nodules. The syndrome is usually seen in India, not Africa.

19. Leishmaniasis

This is the typical history of cutaneous leishmaniasis, acquired from a sandfly bite. Different leishmania species cause this infection in many parts of Central and South America.

Lesions can persist for months and can be mistaken for sporotrichosis, Nocardia brasiliensis infection, tropical pyoderma, Buruli ulcer, Mycobacterium chelonae or Mycobacterium fortuitum infection or pyoderma gangrenosa.

Diagnosis is by culture, PCR or direct fluorescent antibody staining of a skin biopsy.

Normal histopathology stains rarely demonstrates the organism.

If this patient had sporotrichosis from a “thorny bush”, the diagnosis should have been made by fungal culture and fungal stains of the biopsy. Kissing (reduviid) bugs transmit Chagas’ disease, which can cause a localized area of erythema and swelling at the site of inoculation (chagoma) but not a chronic ulcer.

Buruli ulcer, caused by Mycobacterium ulcerans, is probably acquired from water. Lesions progress to the size shown over years, not weeks. The organism can be diagnosed by stain or culture, although cultures must be held at 30C up to 3 months and are only positive in 60% of cases.

20. Tularemia

A painful skin lesion, inflamed swollen draining lymph node (bubo) and fever should call to mind the possibility of tularemia or plague.

It is important to consider these two diagnoses because these infections do not respond to the same drugs used for common infections, such as staphylococcal or streptococcal cellulitis.

Hematogenous dissemination of plague or tularemia to the lung can lead to a severe pneumonia. Staphylococcal or streptococcal cellulitis is not usually associated with pulmonary manifestations unless there is adult respiratory distress syndrome (ARDS) associated with bacteremia.

Plague would be rare in Massachusetts but tularemia is well described, including Nantucket.

Francisella tularensis infects rodents and other small mammals. Humans are infected from bites of ticks and other biting insects (horseflies, mosquitoes, fleas) or accidental inoculation of blood from the animal into a cut or scratch. Unusually, tularemia pneumonia can be acquired from inhalation during cutting lawn or brush that aerosolizes tissue juices from ticks or small rodents.

Treatment of choice for tularemia is gentamicin.

In the question above, ticks leaving a dead squirrel for a new host is the most likely way for the patient to have been infected. Since he did not skin the squirrel, he did not likely get a percutaneous injury that was contaminated.

Cat bites can be a source of Pasteurella multocida sepsis or cat scratch disease (Bartonella henselae) in a normal host but neither bacterium causes pneumonia from a hand lesion.

Cleaning a swimming pool might lead to Legionella pneumonia but this would not cause the hand lesion. Cleaning a pool could lead to Mycobacterium marinum of the affected skin area, but would not lead to systemic illness.

A rusty nail could lead to staphylococcal or streptococcal cellulitis but the hand lesion is atypical of this diagnosis and pneumonia would be unrelated.

21. Meningococcus

This patient has purpura fulminans, usually due to *Neisseria meningitidis.*

Purpura are nonblanchable, hemorrhagic skin lesions that result from the leakage of red blood cells into the skin.

Purpura fulminans is a severe complication of meningococcal disease characterized by the acute onset of cutaneous hemorrhage and necrosis due to infection of capillary endothelial cells with subsequent vascular thrombosis and disseminated intravascular coagulopathy.

The first manifestations is usually cutaneous pain followed by erythema and petechiae. Ecchymoses develop and evolve into painful indurated, purple papules with erythematous borders and then evolve into necrosis and bullae and vesicles. Patients often have concurrent meningitis.

Meningococcal disease is one of the most devastating infections. Disease due to *Neisseria meningitidis* attacks young, previously well individuals and can progress over hours to death.

Mortality can be very high and long-term sequelae can be severe. The mortality and morbidity from meningococcal disease has changed very little since the 1950s.

Keep in mind that complement deficiency involving early and late components of the complement system have been associated with increased susceptibility. Eculizumab, a monoclonal antibody complement inhibitor used for treatment of hemolytic uremic syndrome and paroxysmal nocturnal hemoglobinuria, predisposes to meningococcemia.

22. Babesiosis

This is babesiosis: the best treatment option for babesiosis is atovaquone plus azithromycin

Exchange transfusion is useful when disease is severe.

Fever and hemolysis should raise a limited differential including thrombotic thrombocytopenic purpura (TTP) and E. coli induced hemolytic uremic syndrome, but in this case malaria and babesiosis are suggested by the smear. A good morphologist can recognize this as Babesia, although the lack of foreign travel helps considerably.

These organisms look like plasmodia in that they are intraerythrocytic rings, but malaria and Babesia can be distinguished by morphology, PCR, or serology.

Babesiosis is most common o the Eastern coast such as Shelter Island or Martha's Vineyard and is transmitted by the Ixodes scapularis tick; there is also B. divergens on the West coast and there is Babesia in Europe. Babesiosis can be transmitted by blood transfusion from asymptomatic donors and not become clinically apparent for several weeks after transfusion. That would make a good board question.

Babesia can be especially severe in patients with splenectomy or advanced age or immunosuppression including that due to HIV infection. On the boards, watch also for cases in patients who have received TNF blocking agents or rituximab.

23. Borreliosis

The organism in the blood stream is a spirochete: The only ones seen in the bloodstream in the United States are the agents of tick borne relapsing fever, including B. hermsii. Spirochetes include the genera Spirochaeta, Treponema, Borrelia, and Leptospira. In other regions of the world, Borrelia recurrentis (louse-borne relapsing fever) might be seen in a blood smear.

Why did the patient not report a tick bite? B. hermsii is transmitted to humans through the bite of Ornithodoros ticks. These ticks typically feed for less than 30 minutes and usually at night; consequently, most patients do not recall being bitten.

Rodents are vertebrate reservoirs for the disease, and cabins or homes located at elevations of 2,000--7,000 feet in coniferous forests are common exposure sites. Outbreaks associated with such sites have been reported from 11 Western states.