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Staphylococcal and streptococcal infections

Question 1
Correct answer: B. As there is growth in both sets of cultures, it is very unlikely that this is a contaminant. Given the clinical context, Staphylococcus aureus is the most likely organism.

The clinical scenario suggests metastatic disease involving heart (endocarditis) and lungs (pneumonia or abscess). This is all too familiar with invasive Staph. aureus disease and required urgent investigation and antimicrobial therapy. In addition, the swelling in his leg likely reflects a thrombus (risk factors including IVDU and malnutrition). If bacteraemic with Staph. aureus (particularly if prolonged over 5 days) this thrombus is almost certainly infected. Staphylococcus lugdunensis is a coagulase-negative staphylococci that can produce a clinical phenotype similar to Staph. aureus, in particular its association with endocarditis. Yet the questions ask for the most likely organism and in this scenario it remains Staph. aureus.

Question 2
Correct answer: D. Removal of the prosthetic material, i.e. the line, is the most important course of action here. There is no benefit to adding additional agents (A), although vancomycin (B) may be tried if the central line is very precious; however, this approach often fails because to failure to clear bacterial biofilm on the surface of the line. Persistent bacteraemia and a need to remove the focus of infection have already been demonstrated, so more cultures (C) are unlikely to aid management at this stage. Although the neutrophil count is not known, the issue is infected plastic rather than a lack of innate immune function (E).

Question 3
Correct answer: D. Invasive infections (and therefore culture from a normally sterile site, i.e. A, B and E) and scarlet fever are notifiable. Laboratories often notify the public health service when there is a sterile site culture of Streptococcus pyogenes, but most cases of scarlet fever are not culture-proven. As a result clinicians need to be aware that they are obligible to notify all clinically diagnosed cases of Scarlet fever, even if cultures do not yield Strep. pyogenes. Patients with clinical toxic shock (E) usually have a deep infection that may not be proven microbiologically. It is reasonable for the clinician to notify public health of such cases.

Botulism and tetanus

Question 1
Correct answer: C. A: not commonly associated with infant botulism as an early symptom (constipation is more usual in any case). B: This is not a characteristic finding. C: correct – usually bulbar signs occur early. D: Botulism affects the neuromuscular junction and the striated musculature. E: This is a characteristic sign of tetanus.

Question 2
Correct answer: A. Tetanus toxin inhibits γ-aminobutyric acid transmission in the central nervous system by cleavage of vesicle associated membrane-protein-2 (VAMP-2, also known as synaptobrevin). This prevents presynaptic release of neurotransmitter and consequently disinhibition of the motor and autonomic nervous systems.
Extrapulmonary tuberculosis

**Question 1**
Correct answer: C. National Institute for Health and Care Excellence guidelines recommend that any patient starting biological drugs should undergo screening for active and latent tuberculosis.

**Question 2**
Correct answer: D. All of these are potentially correct, but D is the most appropriate first step as paradoxical reactions are common in patients with TB lymphadenitis; they are usually seen 4–8 weeks after starting treatment, with increased lymph node size. In most instances, this settles after a couple of weeks of treatment, so regular reviews are appropriate. If, however, the lymphadenopathy does not start to reduce, some patients require an adjuvant course of prednisolone (C) to reduce the inflammation, which is safe if the patient is on appropriate therapy. If there are any other concerning ‘red flags’, consider an alternative additional diagnosis such as lymphoma (A), as other conditions, although rarely, can occur concurrently. If the patient has been compliant with medication and GeneXpert testing is negative for *rpoB* mutations, resistance is unlikely; however, drug resistance should be considered (E). You should never change to a MDR TB treatment regime without having access to the genomic or phenotypic sensitivities of the isolate and discussion with an expert in treatment of MDR TB (B).

**Question 3**
Correct answer: E. It is always important to check for pulmonary TB in anyone diagnosed with EPTB as TB can be present at more than one site and pulmonary disease has infection control implications. The patient should have a CXR (A), but the most appropriate investigation to assess infectivity is sputum for AAFB.

Tuberculin test (B) and Interferon-γ release assay (C) are helpful in looking for latent TB, but do not differentiate between latent and active TB, therefore are not helpful in this clinical context as we already know the patient has TB. E- Early morning urines are used to look for urogenital TB and do not have infectivity implications.

**Nocardia and Actinomyces**

**Question 1**
Correct answer: A. 4 years after renal transplant on significant immunosuppression and out with PCP prophylaxis (often stopped at 6 months) yields the patient vulnerable to *Mycobacteria*, PCP, *Toxoplasma*, *Nocardia*, *Listeria*, *Legionella*, fungi and CMV. Of those *Mycobacteria*, *Nocardia* and fungal infections (such as *Aspergillus*) are more likely to produce discrete lesions on the CXR. CMV and *Legionella* can also present in a similar fashion. PCP often produces diffuse ground glass changes on imaging. Polyomavirus can cause infection in renal transplant patients but is not associated with lung infection.

**Question 2**
Correct answer: E. For complicated cases of cervico-facial actinomycosis with extensive sinus formation, surgery is required for excision of fibrotic lesions and marsupialization of sinus tracts. This is then followed by intravenous and then oral penicillin. For mild infections, as in this patient, a prolonged course of an oral penicillin with good bioavailability can be given for 2–6 months. This is usually preceded by an initial course of intravenous benzylpenicillin as in E. B is incorrect as the duration of amoxicillin is too short. Metronidazole and co-trimoxazole are not active against actinomyces (ruling out C and D).

**Toxoplasmosis**

**Question 1**
Correct answer: D. Follow-up testing is required to investigate possible seroconversion. Advice is also correct re: precautions to avoid infection, as a seronegative mother is susceptible. Reassurance is not acceptable (A). Negative NAAT result on EDTA blood does not exclude acute infection (B). Testing of earlier blood from a seronegative patient will be of no help (C). Measurement of IgG avidity would not be possible in the absence of any IgG response (E).

**Question 2**
Correct answer: C. NAAT cannot distinguish between latent and active infection, so that a positive finding in a tissue where latent tissue cysts might be expected, for example, brain, does not confirm active infection. (A). Reactivated *Toxoplasma* infection in the CNS often occurs in the absence of a detectable systemic reactivation (B). IgG concentrations...
(D) are unreliable in patients with immunodeficiency, and avidity testing (E) is only used where a precise estimate of the duration of infection is clinically relevant, for example, in assessing whether infection occurred before or after conception in pregnancy. While NAAT on CSF is the most helpful next step, Toxoplasma tachyzoites may not be present in all cases. Thus, while a positive NAAT finding strongly supports a diagnosis of cerebral toxoplasmosis, a negative result does not unequivocally exclude this.

Question 3
Correct answer: D. Ocular toxoplasmosis may occur either due to the reactivation of a previously latent ocular infection, or symptoms associated with acute infection may not be noticed by the patient or investigated until after the IgM has subsided. (A). Reactivation of latent *Toxoplasma* infection is an extremely rare event, so that presence of IgG is not a helpful indicator of active ocular disease. (B). Active *Toxoplasma* infection within the eye is often localized there and can, therefore, occur without a concurrent para-sitaemia. (C). Ocular toxoplasmosis following acute or recent infection is extremely rare so that demonstration of the latter by a low IgG avidity result is not a helpful diagnostic indicator. (E). *Toxoplasma* tachyzoites are typically released from the site of an active retinal lesion into the vitreous humor (D).

**Herpesviruses**

**Question 1**
Correct answer: D. Testing the booking blood for HSV-2 serology helps to establish whether this is primary disease or reactivation.

**Question 2**
Correct answer: D. Oral valganciclovir should be given as prophylaxis for 3 months after transplantation. This patient has no existing immunity to CMV and has been transplanted with an organ from a CMV positive donor. This patient is at high risk of a CMV reactivation; prophylaxis in the immediate post-transplant period when immunosuppression is at its highest will reduce the risk of this.

**Question 3**
Correct answer: D. Investigations showed anaemia, thrombocytopenia, raised lactate dehydrogenase, triglycerides and ferritin levels. These suggest more sinister pathology associated with EBV such as malignancy or haemophagocytic lymphohistiocytosis. Histological examination of lymph node biopsy is the most useful to establish the diagnosis.

**Erythrovirus B19 infection**

**Question 1**
Correct answer: C. The patient is likely to be viraemic and infectious. He should be separated from high-risk contacts, and barrier nursed in a negative pressure side room. (A). There is no vaccine available (B). Pregnant staff should avoid contact. (C). Erythrovirus B19 infections are not notifiable (D). Being non-enveloped, erythroviruses viruses are resistant to environmental deactivation. Handwashing with soap and water is recommended (E).

**Question 2**
Correct answer: D. Erythrovirus B19 DNA detection in plasma can confirm the diagnosis of transient aplastic crisis, where erythrovirus DNA concentrations are high. Bone marrow aspirate is not required (A). IgM is not detectable until the aplastic crisis starts to subside (C), but a negative IgG test is useful in confirming susceptibility (B). Erythrovirus B19 DNA tests are not done on throat swabs (E).

**Question 3**
Correct answer: E. The woman is susceptible to erythrovirus B19 infection but as yet has no evidence of acute infection. Antibody tests should be repeated for evidence for seroconversion. Maternal infection during the first 20 weeks’ gestation is associated with excess intrauterine fetal death in up to 11% of cases, and hydrops fetalis, which can be successfully treated by intrauterine transfusion (so A is incorrect). The child with the slapped cheek rash is no longer infectious so isolation (C) is unnecessary. Termination of pregnancy (B) is not advised. There is no role for aciclovir (D) in the management of erythrovirus B19.

**Adenovirus infections**

**Question 1**
Correct answer: D. Adenovirus is the most common cause of viral conjunctivitis. Outbreaks of pharyngoconjunctival fever are more common than bacterial conjunctivitis in nurseries. A, B and E are causes of ophthalmia neonatorum, which presents in the first few weeks of life after perinatal infection. Epidemic keratoconjunctivitis (C) is more severe and usually occurs in adults.

**Question 2**
Correct answer: B. Patients do not require inpatient care (A). Some units identify patients at the door and see all patients quickly so there is less time for droplet and fomites formation. As virus particles can remain on hands and medical equipment, these should be cleaned between patients. 70% alcohol > is required to inactivate the virus, and bleach or glutaraldehyde is required for surfaces and equipment (thus excluding C and D). Soap and water (C) is not effective for adenovirus decontamination. Vaccine (E) does not contain the adenovirus types implicated in keratoconjunctivitis, and is licensed only for US military recruits.

**Question 3**
Correct answer: A. The most important factor in clearance of adenovirus infections in severely immunosuppressed populations is a reduction in immunosuppression if possible. Cidofovir is used in practice but is of unproven efficacy. Foscarnet (B) is licensed for use in cytomegalovirus disease
(B). Ribavirin therapy (C) is not advised for adenovirus infections. Ganciclovir (D) is active against herpes virus infections. Ritonavir (E) is a protease inhibitor booster used in HIV infection.

**Influenza and other emerging respiratory viruses**

**Question 1**

**Correct answer:** C. A(H1N1) is currently circulating in seasonal influenza, which is, of the options provided, the most common cause of a viral respiratory illness. A(H7N9) (answer A) is currently circulating in China so is important to consider. A(H5N1) (answer B) has since 2016 only been found in Egypt so is more unlikely. Middle East respiratory syndrome coronavirus (MERS-CoV) (D) is currently circulating in the Middle East and has been found in the UK from returning travellers. Severe acute respiratory syndrome coronavirus (SARS-CoV) (E) has been circulating in China, but there has been no known transmission of the virus since 2004.

**Question 2**

**Correct answer:** A. This patient may have a respiratory infection of public health concern; in particular, infection with MERS-CoV may be the cause. The patient should be isolated to avoid other patients or staff being at risk, and staff should put on personal protective equipment. The next actions are to contact the local Public Health England (PHE) team (E) and then either take samples (B) or consult the PHE website (C), but isolation must come first. Discharge (D) is inappropriate.

**Question 3**

**Correct answer:** B. The hospital laboratory should be contacted first as their staff will liaise with the regional Public Health England (PHE) laboratory. The hospital lab will advise what samples to take, where to send the samples and how. It is important to inform them what test is required so that they know what guidelines to follow (A, C). They may or may not have the facilities to test for specific viruses and may send the sample to the regional PHE laboratory for testing. It is dangerous to give a potentially contagious specimen to another member of staff (D) without warning them of its possible infectious nature, and without labelling and packaging it appropriately. Samples are only sent to Colindale (E) if a regional PHE laboratory obtains a positive result on a specimen, if there is a particular biosafety or other concern, or if specifically requested by PHE.

**Acute viral exanthems**

**Question 1**

**Correct answer:** B. Intravenous aciclovir should be administered until crusting of all the lesions is noted. An immunosuppressed child needs urgent evaluation and immediate intravenous acyclovir in order to prevent viral replication and disease progression. Ibuprofen should be avoided in children with chickenpox as has been associated with necrotizing soft tissue infections. This child would need careful evaluation for any evidence of a super added bacterial infection. As the child is already cropping there is no added benefit in giving varicella zoster immunoglobulin.

**Question 2**

**Correct answer:** D. Oral lesions can be painful and may prevent children from tolerating fluids. Hydrations status should be evaluated.

This is a viral exanthem caused by enteroviruses. Amoxicillin and acyclovir would be inappropriate. Blood tests are rarely indicated. Infants may be asked to keep away from nursery until blisters have resolved.

**Question 3**

**Correct answer:** A. The white lesions in the buccal mucosa are Koplik spots, which are pathognomonic of measles. Rubella (B) typically involves suboccipital lymphadenopathy and may red papules on the hard palate (Forschheimer spots). The rash is non-pruritic which makes Gianotti-Crosti syndrome (C) and varicella (E) highly unlikely. The child had no evidence of painful lesions on the mouth, digits or soles of the feet making hand, foot and mouth disease unlikely too (D).