Lesson 268: PreAnesthetic Assessment of the Patient With HIV Infection

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DATE REVIEWED: July 2007

DISCLOSURES
Dr. Kaye has disclosed that he is a member of the speakers’ bureau of Baxter. The other authors, the reviewer, and the editor have no relationships with pharmaceutical companies or manufacturers of products to disclose. This educational activity may contain discussion of published and/or investigational uses of agents for the treatment of disease. Some uses of these agents have not been approved by the FDA. Please refer to the official prescribing information for each product for approved indications, contraindications, and warnings.

NEEDS STATEMENT
Infection with HIV is a systemic, multiple-organ process for which therapeutic modalities are continuing to evolve. A familiarity with the disease and current therapies is necessary before the anesthetic management of patients is planned. Drug interactions, pulmonary complications, opportunistic infections, and malignancies are more prevalent in this group of patients and may create a challenging environment for the anesthesiologist.

H uman immunodeficiency virus (HIV), a member of the lentivirus subgroup of retroviruses, has been shown to be the cause of acquired immunodeficiency syndrome (AIDS). It is believed that HIV-1 evolved in chimpanzees and crossed over to human beings. Another type of HIV, HIV-2, originated from the simian immunodeficiency virus found in Cercocebus atys in West Africa, where the virus is endemic. HIV probably first entered the United States in the late 1970s; it was first described in 1981.

Epidemiology
Currently, close to 1 million people are infected with HIV in the United States. The number of infected individuals has increased steadily since 2001. In 2003, an estimated 43,171 new cases of AIDS were diagnosed in this country. Additionally, an estimated 18,017 deaths in 2003 were due to AIDS, resulting in an estimated cumulative mortality of 524,060 people from AIDS in the United States. By 2006, the worldwide number of deaths was estimated at 2.9 million, and the estimated number of individuals living with HIV/AIDS was 39.5 million. The number of AIDS-related deaths is decreasing in the United States as a result of antiretroviral therapy.

The transmission of HIV is mediated by sexual contact or exposure to infected blood. Neonates may be exposed directly at the time of delivery, or via breastfeeding or transplacental spread. Currently, the 3 most common routes of transmission are:

- Sexual intercourse
- Parenteral exposure (injection drug use, contaminated needles)
- Mother to baby (vertical transmission)

Preanesthetic Assessment

Dr. Elizabeth A.M. Frost, who is the editor of this continuing medical education series, is clinical professor of anesthesiology at The Mount Sinai School of Medicine in New York City. She is the author of Clinical Anesthesia in Neurosurgery (Butterworth-Heinemann, Boston) and numerous articles. Dr. Frost is past president of the Anesthesia History Association and former editor of the journal of the New York State Society of Anesthesiologists, Sphere. She is also editor of the book series based on this CME program, Preanesthetic Assessment, Volumes 1 through 3 (Birkhäuser, Boston) and 4 through 6 (McMahon Publishing, New York City).

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Read this article, reflect on the information presented, then go online and complete the lesson post-test and course evaluation before November 30, 2008. (CME credit is not valid past this date.) You must achieve a score of 80% or better to earn CME credit.

Time to Complete Activity: 2 hours
Release Date: November 2007
Termination Date: November 30, 2008

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Outcome

At the end of this activity, the participant should be able to:

1. Summarize the special anesthetic problems presented by patients infected with HIV.
2. Describe the systemic changes and symptoms associated with the disease.
3. Apply appropriate preoperative testing and evaluation in this group of patients.
4. Outline the genetic and risk factors for the disease.
5. Describe the most common modes of transmission.
6. Present an anesthetic and analgesic plan.
7. List associated complications.
8. Cite the incidence of the disease.
9. Anticipate, recognize, and manage likely perioperative complications.
10. Discuss drug interactions that may be observed during the perioperative period.

Case History

A 38-year-old homosexual man, scheduled for elective hemorrhoidectomy, complains of progressive pain while swallowing (odynophagia) the day before surgery. The patient is able to swallow liquids and denies any history of reflux disease, ulcers, or hiatal hernia. The physical examination findings are unremarkable, and an upper gastrointestinal study is performed. The gastroenterologist finds white, cheesy exudates in the esophagus and diagnoses esophageal candidiasis.
**Pathophysiology**

HIV is composed of single-stranded RNA that codes for the genes gag, pol, env, and tat. The pol gene encodes reverse transcriptase, an enzyme necessary to copy the viral RNA to double-stranded DNA after the viral genome enters the host cell. Once the double-stranded DNA is formed, it can integrate into the host genome, establishing a latent infection. The viral genome is replicated and produced in the host cell, and as it exits the cell, it can infect other cells.

**Pharmacology**

Several therapeutic regimens are available for the treatment of HIV infection.

**Nucleoside Reverse Transcriptase Inhibitors**

Nucleoside reverse transcriptase inhibitors (NRTIs) remain the most commonly prescribed antiretroviral therapy and are virtually always included in an initial treatment regimen. NRTIs are incorporated into the viral DNA, preventing reverse transcription and therefore inhibiting viral DNA synthesis. Viral replication is prematurely terminated, and infection of new target cells is reduced. NRTIs are specific inhibitors of HIV reverse transcriptase, but they also inhibit human mitochondrial DNA polymerase γ to varying degrees. Commonly used NRTIs are zidovudine, lamivudine, emtricitabine, and abacavir.

**Side effects commonly reported with zidovudine treatment include headache, insomnia, nausea, and vomiting.** Prolonged therapy can lead to neuropathy, malaise, myalgia, and myopathy with increased levels of creatinine phosphokinase, and pancytopenia. Peripheral neuropathy, the most common side effect of zidovudine, correlates with the severity of HIV infection and may occur in 30% of patients. Lamivudine is the least neurotoxic of the currently used nucleoside analogs, but it may exacerbate preexisting neuropathy. However, combined antiretroviral therapy has been shown to mitigate HIV-related peripheral neuropathy. Peripheral neuropathy generally reverses on cessation of therapy.

**Non-nucleoside Reverse Transcriptase Inhibitors**

Non-nucleoside reverse transcriptase inhibitors (NNRTIs) act at the same step in the HIV life cycle as NRTIs, but they do not require intracellular phosphorylation and thus do not inhibit human DNA polymerases. The NNRTIs most commonly used are nevirapine, delavirdine, and efavirenz. Nevirapine strongly induces the cytochrome P-450 3A4 (CYP3A4) isoenzyme, whereas efavirenz is a mixed inducer/inhibitor of the same enzyme. The major side effect is skin rash, including Stevens–Johnson syndrome. Because it induces a cytochrome P-450 enzyme, the administration of nevirapine may decrease the serum levels of some anesthetics or sedatives (ie, midazolam and fentanyl). Efavirenz is a potent teratogen that should be avoided during the first trimester of pregnancy.

**Protease Inhibitors**

Protease inhibitors (PIs) function by preventing the cleavage of viral precursor proteins into the subunits required for the formation of new virions. This causes a cessation of the production of new virus from currently infected cells. The most commonly used PIs are saquinavir, ritonavir, indinavir, and nelfinavir. Side effects are gastrointestinal symptoms, hyperglycemia, peripheral neuropathy, increased liver enzymes, and hypertriglyceridemia. Indinavir may be associated with mild hyperbilirubinemia, hematuria, and renal failure resulting from obstructive uropathy.

**Integrase Inhibitors**

Recently, the FDA approved the use of a new class of antiretroviral drugs called integrase inhibitors. Inhibition of the enzyme integrase helps prevent the virus from inserting its DNA into human DNA, thereby stunting its ability to infect new cells and slowing the infectious process. Approval was given following a 24-week study of almost 700 patients infected with multidrug-resistant HIV. The data showed that the novel drug, raltegravir, "reduced the virus to less than could be detected after 4 months in 61% to 62% of patients who got the medicine in combination with other anti-HIV drugs." Side effects of the new drug include rashes, diarrhea, nausea, and headaches.

The targeted population for the use of raltegravir are patients infected with difficult-to-treat strains of HIV. The drug will be affordable; the recommended dosage of a 400-mg tablet taken twice daily will cost approximately $27 per day. There are currently no published studies investigating the interactions of this new class of drugs with anesthetic agents.

**Fusion Inhibitors**

Fusion (entry) inhibitors such as enfuvirtide are a new class of antiretrovirals that effectively block viral entry into the cell and cause no cross-resistance to other antiretroviral agents currently approved by the FDA. Fusion inhibitors must be used in conjunction with other retroviral regimens. The main side effects are injection site reactions. Many patients complain of pain, induration, and erythema after injection.

**Side Effects and Drug Interactions With Anesthetics**

Before the administration of an anesthetic, the anesthesiologist should be aware of the possibility of interactions of antiretroviral drugs with anesthetics and toxic side effects (Table 1). The treatment of a patient with a myopathy or neuropathy may alter the choice of anesthetic technique. Anemia and thrombocytopenia are major adverse effects of zidovudine. PIs can affect glucose metabolism, leading to hyperglycemia, hyperlipidemia, and hypertriglyceridemia. PIs also increase the risk of neuropathy, which can exacerbate preexisting motor or sensory peripheral neuropathy.

**Anesthesia and HIV Infection**

Anesthesia News publishes the most current and relevant information about anesthesia and HIV infection. The targeted population for the use of raltegravir are patients infected with difficult-to-treat strains of HIV. The drug will be affordable; the recommended dosage of a 400-mg tablet taken twice daily will cost approximately $27 per day. There are currently no published studies investigating the interactions of this new class of drugs with anesthetic agents.
metabolism. Foscarnet and PIs can cause renal toxicity. Foscarnet can also alter calcium and magnesium levels by chelating divalent metal ions, thereby decreasing serum calcium levels.

Side effects of other agents include ventricular arrhythmia (I.V. pentamidine) and bronchospasm (aerosolized pentamidine). Nevirapine is an inducer of cytochrome P-450, and therefore increased doses of anesthetic drugs may be required in patients receiving nevirapine. PIs (eg, ritonavir), as inhibitors of cytochrome P-450, impair the metabolism of midazolam, fentanyl, and other anesthetics and analgesics, in addition to cardiac drugs such as amiodarone and quinidine (Figure). Etomidate, atracurium, remifentanil, and desflurane are not dependent on hepatic cytochrome P-450 metabolism and therefore are preferable drugs.

Because of the myriad of drug interactions, the anesthesiologist may consider regional anesthesia as the mode of anesthetic delivery. An advantage of regional anesthesia is that it does not interfere with antiretroviral drugs or the immune system. Contraindications to regional anesthesia (apart from patient acceptance and the surgical site) include sepsis, platelet abnormalities, and the risk for seeding HIV into the central nervous system via a bloody tap. The presence of neuropathy may diminish the appeal of regional anesthesia, but there are no data suggesting a contraindication. In a review of 96 HIV-positive parturients, of whom 36 delivered after receiving regional anesthesia, the advantages of regional anesthesia were confirmed. In 2002, Avidan et al studied the effect of spinal anesthesia in 45 parturients treated for HIV who had cesarean deliveries; no perioperative complications or changes in the viral load were noted.

Perioperatively, magnetic resonance imaging studies can be useful, although they are not commonly performed. Images of the spinal cord in 55 symptomatic patients infected with HIV showed involvement of the spinal cord in 49 patients—mostly of infectious origin. Many patients compromised by HIV are drug abusers, diabetics, or organ transplant recipients on long-term steroid treatment in whom spinal infections develop. Such infections are often diagnosed too late because the patients present mostly with back pain or other neurologic signs or symptoms. Prolonged epidural catheterization in such severely compromised patients may be contraindicated. However, in a series of 350 patients with cancer who underwent prolonged epidural catheterization and were monitored closely for possible infection and promptly treated, no adverse sequelae were found.

### Common Adverse Effects of Drug Therapy

Adverse effects on mitochondria can manifest as hyperlactatemia, hepatic steatosis, peripheral neuropathy, myopathy, and lipodystrophy. Although the exact pathogenesis in the HIV-infected patient is debatable, the most likely culprits are NRTIs. NRTIs have toxic effects on mitochondria by inhibiting mitochondrial DNA polymerase γ. Mitochondrial toxicity is less common now because the newer NRTIs (lamivudine, tenofovir, and abacavir) have a lower affinity for mitochondrial DNA polymerase γ than do older NRTIs (didanosine, stavudine [d4T], zalcitabine—often referred to as D-drugs).

Dyslipidemia can result from antiretroviral administration. Regular monitoring of cholesterol and triglyceride levels is required, and lipid-lowering agents are often indicated. The metabolic syndrome, type 2 diabetes, and vascular events are also complications of antiretrovirals. An association between PI exposure and increased risk for cardiovascular events is well established; the link

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### Table 1. Effect of PIs and NNRTIs on CYP3A4 and Specific Drug–Drug Interactions

<table>
<thead>
<tr>
<th>Drug</th>
<th>CYP3A4</th>
<th>NNRTIs</th>
<th>Common PIs</th>
<th>Atazanavir</th>
<th>Indinavir</th>
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### Antimicrobials

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### Anticonvulsants

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### Centrally acting agents

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### Gastrointestinal agents

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### Lipid-lowering agents

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### Others

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<th>Common PIs</th>
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*Data from www.hiv-druginteractions.org.

*No longer available in the United States.

+, mild effect on CYP450; ++, modest effect on CYP450; ++++, highly significant effect on CYP450; 0, no interaction; x, use with caution; monitor drug levels and response, and look for adverse effects; xxx, concomitant administration is contraindicated.

NNRTIs, non-nucleoside reverse transcriptase inhibitors; PIs, protease inhibitors
(although weaker) has also been demonstrated with NRTIs and NNRTIs. New antiretroviral drugs with fewer effects on lipids and insulin resistance are under development.

Clinical Presentation

Initially, the acute stage of HIV infection can be subclinical or cause a mononucleosis-like prodrome of fever, sore throat, lethargy, headache, nausea, vomiting, diarrhea, rash, lymphadenopathy, aseptic meningitis, and/or leukopenia. The number of CD4+ T-cells is within normal range; however, this acute stage lasts approximately 7 to 10 days. Even though the majority of patients with an HIV infection are asymptomatic, many cases are initially misdiagnosed because of the similar prodromes of other viral illnesses and the lack of detectable HIV-1 antibodies. It is essential for the clinician to obtain a sexual history for high-risk behavior when a sexually active person presents with symptoms of viral meningitis, lymphadenopathy, sore throat, or fever. Death most often results from opportunistic infections, cancer, or wasting. Opportunistic infections occur because of the decrease in the cell-mediated immunity of the patient.

Diagnosis and Differential Diagnosis

Acute HIV-1 infections can be diagnosed by the detection of HIV-1 RNA in the plasma in the absence of HIV antibodies (Table 2). Most assays for HIV-1 RNA have sensitivity rates near 100%; however, approximately 2% to 5% of tests have been shown to yield in false-positive results, which indicate viral loads much smaller than those normally seen during acute infections. When the same samples are retested, true-negative results are obtained. The detection of p24 (HIV antigen) has a much lower sensitivity and a lower specificity than assays for HIV-1 RNA. A CD4+ T-cell count should be obtained, along with a complete blood cell count, chemistry profile, and measurements of the transaminase, blood urea nitrogen, and creatinine levels.

Infectious mononucleosis is the most important illness to rule out in the differential diagnosis of HIV infection. Other considerations in the differential diagnosis include hepatitis, syphilis, influenza, and the side effects of various medications.

Antiretroviral Chemotherapy

The use of current antiretroviral agents can slow the progression of HIV infection to AIDS (Table 3). Treatment should begin if the patient has a history of an AIDS-defining illness or severe symptoms of an HIV infection, regardless of the CD4+ T-cell count. The clinician should also initiate treatment if the CD4+ T-cell count is less than 200/mm³. Treatment should be offered to patients with a CD4+ T-cell count of 201 to 350/mm³. When a patient's CD4+ T-cell count is higher than 350/mm³ and the plasma HIV RNA level is higher than 100,000 copies per mL, the decision to treat is left to the discretion of the clinician. When a patient's CD4+ T-cell count is higher than 350/mm³ and the plasma HIV RNA level is less than 100,000 copies per mL, therapy should be deferred.

Opportunistic Infections

Opportunistic infections are a significant source of morbidity and mortality in patients infected with HIV. The use of antiretroviral therapy has helped in preventing and treating opportunistic infections. Antiretroviral therapy also increases the cell-mediated immune response, which is important for vaccination. Vaccines elicit better immunologic responses in patients with higher CD4+ T-cell counts. Live attenuated vaccines should not be given to HIV-infected patients because they are immunocompromised. Therefore, they may not respond as well as normal persons to the vaccine and may be at greater risk for experiencing side effects from the vaccination.

The early diagnosis and treatment of Mycobacterium tuberculosis infection is critical in an immunosuppressed patient to prevent acceleration of the disease. Patients who react positively to skin testing with Siebert purified protein derivative of tuberculin can be treated for 6 months with isoniazid or rifampin. An alternative initial treatment with rifabutin, pyrazinamide, or ethambutol given for 2 months followed by 4 months of treatment with isoniazid or rifampin is also acceptable.

A very widespread and common problem among immunosuppressed patients is P. carinii pneumonia. Trimethoprim-sulfamethoxazole is the first-line treatment and should be administered as prophylaxis if the CD4+ T-cell count decreases to less than 200/mm³. Patients with a history of P. carinii pneumonia should be given trimethoprim-sulfamethoxazole for life, unless antiretroviral therapy restores immune system function.

Toxoplasma gondii encephalitis is an opportunistic
Table 3. Initiation of Antiretroviral Chemotherapy

<table>
<thead>
<tr>
<th>Patient Indications</th>
<th>Treatment Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of AIDS-defining illness or severe symptoms of HIV infection regardless of CD4+ T-cell count</td>
<td>Initiate treatment</td>
</tr>
<tr>
<td>CD4+ T-cell count of 201-350/mm³</td>
<td>Offer treatment to patient</td>
</tr>
<tr>
<td>CD4+ T-cell count &gt;350/mm³ and plasma HIV RNA level &gt;100,000 copies per mL</td>
<td>Clinician’s discretion</td>
</tr>
<tr>
<td>CD4+ T-cell count &gt;350/mm³ and plasma HIV RNA level &lt;100,000 copies per mL</td>
<td>Defer therapy</td>
</tr>
</tbody>
</table>

Table 4. General Precautions for Treating HIV-Infected Patients

- Wear gloves.
- Health care workers with open lesions should avoid direct contact with patients.
- Use caution when handling sharps.
- Use eye shields when there is a chance of eye exposure to blood or bodily fluids.
- Do not recap needles; immediately dispose of used needles in appropriate containers.
- Use appropriate equipment for cardiopulmonary resuscitation to prevent mouth-to-mouth contact.

Table 5. Chemoprophylaxis for Percutaneous Exposure to HIV-1–Infected Materials

<table>
<thead>
<tr>
<th>Source Material</th>
<th>Antiretroviral Prophylaxis</th>
<th>Antiretroviral Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Percutaneous exposure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Blood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest risk</td>
<td>Recommended</td>
<td>AZT plus lamivudine plus indinavir</td>
</tr>
<tr>
<td>Increased risk</td>
<td>Recommended</td>
<td>AZT plus lamivudine with or without indinavir</td>
</tr>
<tr>
<td>No increased risk</td>
<td>Offer</td>
<td>AZT plus lamivudine</td>
</tr>
<tr>
<td>2. Fluid containing visible blood or potentially infectious fluid or tissue</td>
<td>Offer</td>
<td>AZT plus lamivudine</td>
</tr>
<tr>
<td>3. Other bodily fluids (urine, saliva)</td>
<td>Do not offer</td>
<td>–</td>
</tr>
<tr>
<td><strong>Mucomembranous exposure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Blood</td>
<td>Offer</td>
<td>AZT plus lamivudine with or without indinavir</td>
</tr>
<tr>
<td>2. Fluid containing visible blood or potentially infectious fluid or tissue</td>
<td>Offer</td>
<td>AZT plus lamivudine with or without indinavir</td>
</tr>
<tr>
<td>3. Other bodily fluids (urine, saliva)</td>
<td>Do not offer</td>
<td>–</td>
</tr>
</tbody>
</table>

**Skin exposure (increased risk)***

<table>
<thead>
<tr>
<th>Source Material</th>
<th>Antiretroviral Prophylaxis</th>
<th>Antiretroviral Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Blood</td>
<td>Offer</td>
<td>AZT plus lamivudine with or without indinavir</td>
</tr>
<tr>
<td>2. Fluid containing visible blood or potentially infectious fluid or tissue</td>
<td>Offer</td>
<td>AZT plus lamivudine with or without indinavir</td>
</tr>
<tr>
<td>3. Other bodily fluids (urine, saliva)</td>
<td>Do not offer</td>
<td>–</td>
</tr>
</tbody>
</table>

AZT, azidothymidine (zidovudine)

* Increased risk includes prolonged contact or exposure to high titers of HIV-1 of an extensive area or an area of compromised skin integrity. For cases of skin exposure without increased risk, the risk for drug toxicity outweighs the potential benefits. Referenced from the Web site www.cdc.gov/mmwr/preview/mmwrhtml/00042200.htm.

Infection for which the risk is greatest among patients whose CD4+ T-cell counts are less than 50/mm³. The drug regimen of choice is a combination of pyrimethamine, sulfadiazine, and leucovorin.

**Perioperative Anesthetic Management**

The risk for contracting HIV by percutaneous exposure with an instrument infected with HIV is approximately 0.3%; however, the risk increases as the severity of the injury rises beyond a simple needlestick. To minimize the risk to health care providers, universal precautions must be followed (Table 4). The following precautions must be observed for all patients:

1. Health care providers should wear gloves and be cautious when handling sharp objects.
2. Needles should not be recapped and must be disposed of immediately in appropriate containers.
3. Health care providers should wear eye shields if there is a chance that blood or bodily fluids will contact the eye.
4. Health care workers with open lesions should avoid direct patient care.
5. For cardiopulmonary resuscitation, equipment such as disposable bag valve masks should be used to avoid mouth-to-mouth contact.

In the event of accidental exposure, the exposed health care worker should be evaluated within hours—not days—and should be tested with his/her consent for the presence of HIV at baseline. The side effects of the medications for postexposure prophylaxis should be weighed against the likely risk for exposure. Postexposure prophylaxis should be initiated as soon as possible following an exposure. Currently, most postexposure prophylaxis regimens involve a combination of 2 drugs. The most common regimen uses zidovudine and lamivudine. Appropriate antiretroviral prophylaxis is outlined in Table 5. The preoperative assessment of the patient should include a thorough history and review of medications, in addition to an accurate CD4+ T-cell count. Patients with high T-cell counts (500-700 CD4+ T-cells per mm³) are usually not receiving antiretroviral medications and are less likely to have complications. The renal and hepatic function of patients in whom the CD4+ T-cell count is less than 200/mm³ should be tested, and blood cell counts and clotting function documented. Electrocardiography, chest radiography, and arterial blood gas analyses may also be performed because patients are at increased risk for cardiovascular complications.

HIV infection is systemic, with manifestations in multiple organs. The pulmonary, neurologic, cardiovascular, and
hematologic manifestations of HIV infection are of particular interest to the anesthesiologist. Bacterial and viral infections, such as those caused by P. carinii and M. tuberculosis, and fungal infections, such as aspergillosis and candidiasis, may cause pulmonary complications associated with anesthesia. For example, such infections have the potential to impair oxygenation. Care must be taken when tracheal tubes are placed to avoid introducing an opportunistic infection. Patients with AIDS may be transported with a mask if the mask decreases the likelihood of contracting an opportunistic infection. Anesthetic equipment should be treated as a potential source of infection; thus, disposable anesthetic delivery circuits with bacterial filters should be considered. Masks during patient transport and disposable anesthetic circuits have both been used at some institutions.

Several neurologic complications must be considered when a patient infected with HIV is treated. Myelopathies, Guillain-Barré syndrome, peripheral neuropathies, brachial neuritis, and cauda equina syndrome are associated with the acute stage of HIV infection. In the later stages of HIV infection, neurologic complications from opportunistic infections can occur. Another neurologic complication is HIV-associated dementia, which can be controlled with antiretroviral therapy; however, a less severe form of the dementia can still exist.

The general side effects associated with antiretroviral medications (eg, hyperglycemia, hyperlipidemia, and coronary arteriosclerosis) as well as the increased life expectancy of the HIV-infected individuals being treated with them contribute to a relatively high number of cardiovascular complications in these patients. PIs are associated with the dyslipidemias observed in antiretroviral therapy and put patients at risk for myocardial infection at a relatively young age.

Other cardiovascular complications associated with HIV infection include cardiomyopathy, left ventricular hypertrophy, myocarditis, pulmonary hypertension, pericardial effusion, endocarditis, and malignancy. These complications can be due to the infection, immunosuppression, or the drug therapy. Cases of myocarditis, a significant cause of death in adults younger than 40 years of age, can range in severity from asymptomatic to congestive heart failure. The recommended therapy for myocarditis is supportive care. In cases of congestive heart failure, ionotropes, diuretics, angiotensin-converting enzyme inhibitors, nitroglycerin, nitroprusside, or ventilator-assist devices may be used.

Hematologic complications such as thrombocytopenia, leukopenia, anemia, and bone marrow suppression can develop in patients infected with HIV. Although thrombocytopenia is generally not considered to be clinically important, it can worsen as the disease progresses. Bone marrow suppression is a reversible side effect of some of the antiretroviral medications.

In addition to the various dyslipidemias caused by PIs such as lopinavir and ritonavir, other significant side effects and drug interactions are associated with antiretroviral therapy, including increased serum levels of aminotransferases, glucose intolerance, and inhibition of CYP3A4. For example, because of the inhibition of the cytochrome enzyme by ritonavir that causes a reduced clearance of fentanyl, respiratory monitoring needs to be maintained for a longer time in such cases; the fentanyl dose should be adjusted accordingly. Benzodiazepines and other opioids must also be used with caution—again because of the inhibition of cytochrome enzymes. A list of all drugs used by the patient, laboratory test results, and information about side effects experienced by the patient must be obtained and the patient’s primary care provider consulted.

Despite theoretical concerns about administering general anesthesia, it is not associated with a significant incidence of undesirable outcomes. Some transient immunologic changes have been noted but appear to be clinically insignificant. An underlying pulmonary disease, however, is more important. Patients with repeated P. carinii infections, for example, may have pulmonary damage, and it may therefore be sensible to avoid endotracheal intubation. In such cases, regional anesthesia may be a feasible option—which may apply to any patient with lung damage.

The appropriate use of regional anesthesia has been debated based on reports of adverse outcomes. The concerns about regional anesthesia have centered on the safety of spinal and epidural procedures, with the fear of extending the HIV infection into the central nervous system. However, infection in the central nervous system is an early manifestation of the disease, and a failure to culture HIV in the cerebrospinal fluid is probably due to sampling error. Furthermore, Hughes et al have demonstrated the efficacy and safety of regional anesthesia. In fact, regional anesthesia for cesarean deliveries as well as other surgical procedures may prove beneficial. The regional approach has been associated with a decreased requirement for parenteral opioids; thus, the possible side effects caused by the effect of a PI on drug metabolism may be curtailed.

Although there may be theoretical risks associated with the use of an epidural blood patch, it is appropriate and safe for the treatment of postdural puncture headache. Acute and long-term follow-up of HIV-positive patients has found no evidence of a unique risk associated with epidural blood patches.

The treatment of patients with HIV-related oral lesions can prove challenging. A careful inspection of the airway can reveal a variety of HIV-induced lesions, such as oral candidiasis with or without oropharyngeal involvement, oral hairy leukoplakia, recurrent aphthous-like ulcerations, oral Kaposi’s sarcoma, orobuccal herpes simplex infection, oral herpes zoster infection, intraoral or perioral warts, and HIV-associated periodontal diseases. The lesions may cause pain, abscess, or edema that result in a difficult airway.

In the writers’ experience, the application of nebulized lidocaine for 15 minutes or topical anesthetic spray (benzocaine-butamben-tetracaine) can facilitate fiber-optic airway intubation in awake patients. The pain associated with opening the mouth is relieved, in case a jaw thrust maneuver becomes necessary. An abscess or edema near the pharynx may obstruct the view of the vocal cords. Patients who have painful oral lesions may refuse to eat; this can lead to malnutrition and hypoalbuminemia. In this scenario, the clinical anesthesiologist should evaluate the patient for any signs of dehydration or electrolyte abnormalities that may need to be corrected before surgery. Furthermore, the levels of drugs that bind to plasma proteins may be elevated and a dose reduction required.

Postoperatively, criteria for the management of patients with communicable diseases are followed in the postanesthesia care unit. Nurses in charge of caring for these patients should not concurrently care for other patients in the hospital.

Management of the Case Presented

Laboratory results revealed a CD4+ T-cell count of 188/mm³, antiretroviral therapy and fluconazole were started. The results of tests of hepatic and renal function were within normal limits, as were the prothrombin time and activated partial thromboplastin time. Chest X-ray films showed no evidence of infiltrates in the lungs. Using a regional anesthetic technique, the surgeon performed a hemorrhoidectomy without complication. The patient was sent to the recovery room in stable condition.

Summary

Although modern medical care and current therapies save and prolong the lives of many patients with HIV/AIDS, the disease process has no cure and will continue to challenge clinicians during the perioperative period. Patients of all ages, young and old, may present with the pathology, and therefore the anesthesiologist must have a sound knowledge of the disease and its treatment, complications, and multiple-organ manifestations. A periodic review of the current treatment modalities for HIV will be necessary because pharmacologic strategies are ever evolving.

Selected Bibliography


Post-test

1. Which statement is true concerning infection with human immunodeficiency virus (HIV)?
   a. Expression of the CD4 molecule alone on the cell surface is sufficient for HIV infection.
   b. The CD4 molecule has a high affinity for the HIV envelope glycoprotein gp17.
   c. HIV is attracted to CD4+ helper T cells.
   d. HIV CD4+ molecules are strongly attracted to T-cell gp120 and gp41 glycoproteins.

2. After HIV is inserted into the host’s genome, which enzyme is responsible for transcribing HIV mRNA?
   a. Integrase
   b. HIV transcriptase
   c. Viral RNA polymerase
   d. Host cell RNA polymerase

3. Which is the most common mechanism by which HIV causes a loss of T cells?
   a. Viral replication and cell lysis
   b. Destruction of T-cell progenitor cells
   c. Initiation of the Bcl-2 pathway
   d. Shortening of cellular telomeres

4. Patients infected with HIV are most infectious during which stage:
   a. acute
   b. latent
   c. late
   d. both a and c

5. Which of the following conditions can be considered “AIDS-defining”?
   a. Cushing’s disease
   b. Tuberculosis
   c. Influenza
   d. Rhabdomyosarcoma

6. Which statement is false concerning HIV infection?
   a. Many cases of HIV infection are initially misdiagnosed because of the similarity of the prodromes of several viral infections.
   b. Initially, detectable HIV-1 antibodies are lacking.
   c. Most cases of HIV infection are asymptomatic.
   d. The acute stage lasts approximately 7 to 10 days.

7. Which statement is true regarding the diagnosis of HIV-1 infection?
   a. Most HIV-1 RNA assays have sensitivity rates near 100%, but the false-positive rate ranges from 2% to 5%.
   b. HIV-1 RNA assays are unable to diagnose HIV-1 infection.
   c. Detection of p24 has a higher sensitivity and a lower specificity than HIV-1 RNA assays.
   d. It is unimportant to obtain a CD4+ T-cell count.

8. In which of the following cases is it unnecessary to begin antiretroviral chemotherapy?
   a. In a 46-year-old man whose CD4+ T-cell count is 175/mm³
   b. In a 22-year-old woman whose CD4+ T-cell count is 250/mm³ and who has P. carinii pneumonia
   c. In a 35-year-old man whose CD4+ T-cell count is >350/mm³ and whose plasma HIV RNA level is <100,000 copies per mL
   d. In a 53-year-old woman with a history of repeated Candida infections of the bronchi and whose CD4+ T-cell count is 300/mm³.

9. Which of the following is appropriate chemoprophylaxis for a health care worker who has stuck by a needle from a patient with a high HIV titer?
   a. Azidothymidine (AZT) plus lamivudine plus indinavir
   b. AZT plus lamivudine
   c. AZT with or without lamivudine
   d. No chemoprophylaxis is needed.

10. Which statement is false?
    a. An epidural blood patch is a safe method to treat post-dural puncture headache.
    b. Benzodiazepines and other opioids must be used with caution when treating a patient receiving antiretroviral chemotherapy.
    c. It is safe to administer general anesthesia to an HIV-infected individual.
    d. Ritonavir has been shown to increase the clearance of fentanyl.