Anesthetic implications of the acquired immunodeficiency syndrome (AIDS): Part I

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The acquired immunodeficiency syndrome (AIDS) is an epidemic that is demanding international attention. It is the professional duty of nurse anesthetists to increase their knowledge of the characteristics of this disease. Nurse anesthetists are a vital link in the promotion of health care safety because of their potential occupational exposure to the virus that causes AIDS. Part I of this article explores the characteristics of the disease, population trends, and ongoing research, while Part II, to be featured in the December, 1986 AANA Journal, will present recommended anesthesia safety precautions.

Publicity and public concern about the acquired immunodeficiency syndrome increase daily because of new medical discoveries and because this fatal disease continues to spread throughout the general population. By the end of 1985, according to the Centers for Disease Control (CDC) and others, there were about 1.75 million to 2 million Americans infected by the virus that causes AIDS, and the number was growing by 1,000 a day. As of late 1985, upwards of 1,000 health care workers were known to have been exposed to infectious substances from AIDS patients, and three workers with no known risks (two in the United States, one in England) are known to have been infected, through parenteral exposure on the job, by the virus that causes AIDS. Thus, anesthetists and other health care workers should obtain sufficient knowledge about this syndrome in order to provide optimal patient care and to employ proper infection control practices to minimize occupational exposure.

The etiology of AIDS

During 1983 and 1984, three groups of medical researchers almost simultaneously discovered the etiologic link between AIDS and newly identified retroviruses that are variants of the same virus. These retroviruses have been named the human T-cell lymphotropic virus type III (HTLV-III), the lymphadenopathy-associated virus (LAV), and the AIDS-associated retrovirus (ARV). The major difference among these variants, apparently, is the protein in the outer shell of the virus. Most discussions of AIDS use the terms "HTLV-III" or "HTLV-III virus" as all-inclusive references to the various retroviruses, and those will be the terms used consistently in this article.

The distinguishing feature of a retrovirus is its mechanism of replication. A retrovirus carries its genetic information in RNA rather than in DNA. The HTLV-III retrovirus uses one of its own enzymes, known as reverse transcriptase, to make a DNA copy of its RNA. The acquired immunodeficiency syndrome occurs because HTLV-III is lymphotropic and neurotropic, acting directly on (1) T-4 lymphocytes,
the white blood cells that serve a primary role in the body’s immune system, and/or (2) some part of the central or peripheral nervous systems.

Because of HTLV-III’s affinity for T-4 cells, the AIDS patient eventually ends up with an inadequate number of helper T-4 cells. Thus the victim’s immune system is weakened and his body is susceptible to various opportunistic infections, several kinds of cancer, and a variety of neurologic disorders.

However, neurologic or brain diseases may occur independently of immunodeficiency. Recent research has found HTLV-III in cerebrospinal fluid, the spinal cord, brain tissue, and nerve tissue of both the central and peripheral nervous systems of patients with AIDS or AIDS-related diseases. Moreover, HTLV-III apparently is able to replicate itself in the brain or cerebrospinal fluid, and this replication may occur without causing any clinical manifestations of neurologic disease.

### Table I

Centers for Disease Control surveillance definition of AIDS

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Criteria</th>
</tr>
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<tbody>
<tr>
<td>Protozoal and helminthic infections</td>
<td></td>
</tr>
<tr>
<td>1. Cryptosporidiosis, intestinal, causing diarrhea for more than one month (HS or SMS).</td>
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<tr>
<td>2. Pneumocystis carinii pneumonia (HS or microscopic study of a “touch” preparation or bronchial washings).</td>
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<tr>
<td>3. Strongyloidosis, causing pneumonia, central nervous system infection, or disseminated infection (HS).</td>
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<tr>
<td>4. Toxoplasmosis, causing pneumonia or central nervous system infection, or disseminated infection (HS).</td>
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<tr>
<td>5. Isosporiasis, causing chronic diarrhea for more than one month (HS or SMS), if patient also has a positive serology or virology test for HTLV-III.</td>
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<tr>
<td>Fungal infections</td>
<td></td>
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<tr>
<td>1. Candidiasis, causing esophagitis (HS or microscopic study of a “wet” preparation from the esophagus, or endoscopic findings of white plaques on an erythematous mucosal base).</td>
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<tr>
<td>2. Bronchial or pulmonary candidiasis (diagnosed by microscopy or by the presence of characteristic white plaques grossly on the bronchial mucosa; not by culture alone), if the patient also has a positive serology or virology test for HTLV-III.</td>
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<tr>
<td>3. Cryptococcosis, causing central nervous system or disseminated infection (C or AD or HS or India ink preparation of cerebrospinal fluid).</td>
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<tr>
<td>4. Disseminated histoplasmosis, not confined to lungs or lymph nodes (C or HS or AD), if the patient also has a positive serology or virology test for HTLV-III.</td>
<td></td>
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<tr>
<td>Bacterial infections</td>
<td></td>
</tr>
<tr>
<td>1. “Atypical” mycobacteriosis (species other than tuberculosis or lepra; e.g., m. avium), causing disseminated infection (C).</td>
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<tr>
<td>Viral infections</td>
<td></td>
</tr>
<tr>
<td>1. Cytomegalovirus, causing pulmonary, gastrointestinal tract, or central nervous system infection (HS).</td>
<td></td>
</tr>
<tr>
<td>2. Herpes simplex virus, causing chronic mucocutaneous infection with ulcers persisting more than one month, or pulmonary, gastrointestinal tract, or disseminated infection (C or HS or cytologic study).</td>
<td></td>
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<tr>
<td>3. Progressive multifocal leukoencephalopathy (presumed to be caused by papovavirus) (HS).</td>
<td></td>
</tr>
<tr>
<td>Cancer</td>
<td></td>
</tr>
<tr>
<td>1. Kaposi’s sarcoma in persons less than 60 years of age. (HS).</td>
<td></td>
</tr>
<tr>
<td>2. Kaposi’s sarcoma in persons who are 60 years of age or older when diagnosed (HS), if the patient also has a positive serology or virology test for HTLV-III.</td>
<td></td>
</tr>
<tr>
<td>3. Lymphoma limited to the brain (HS).</td>
<td></td>
</tr>
<tr>
<td>4. Non-Hodgkin’s lymphoma of high-grade pathologic type (diffuse, undifferentiated) and of B-cell or unknown immunologic phenotype (as diagnosed by biopsy), if the patient also has a positive serology or virology test for HTLV-III.</td>
<td></td>
</tr>
<tr>
<td>5. Lymphophreticular malignancy diagnosed more than three months after the diagnosis of an opportunistic disease used as a marker for AIDS (HS).</td>
<td></td>
</tr>
<tr>
<td>Exclusions</td>
<td></td>
</tr>
<tr>
<td>Patients will be excluded as AIDS cases if they have a negative result on testing for serum antibody to HTLV-III, have no other type of HTLV-III test with a positive result, and do not have a low number of T-helper lymphocytes or a low ratio of T-helper to T-suppressor lymphocytes. In the absence of test results, patients satisfying all other criteria in the definition will continue to be included.</td>
<td></td>
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</tbody>
</table>

From Selik, Haverkos and Curran and the CDC
The definition of AIDS

The CDC and officials in its AIDS activity section have set forth rudimentary and refined surveillance definitions of reportable AIDS cases. The common theme: AIDS exists when there is one or more infectious or neoplastic disease(s) associated with underlying cellular immunodeficiency in a person with no known cause for such impairment. Tables I and II provide the most current and comprehensive information on the CDC's surveillance definition of AIDS (both in general and in children), the diseases associated with the syndrome, and the diagnostic methods deemed reliable.

With regard to the cancers and infectious diseases mentioned in Table I, CDC data show that as of mid-September 1985, with 13,228 cases of AIDS reported, 57% of the victims had pneumocystis carinii pneumonia (PCP), 19% had Kaposi's sarcoma (KS), 6% had both PCP and KS, and 18% had other opportunistic diseases without KS or PCP. Thus, PCP is the predominant marker of AIDS, occurring in about 63% of its victims. KS is also a clue; a new and virulent form of this cancer is found in about one-third of homosexual AIDS victims but in only about 6% of drug abusers with AIDS.

PCP is an ominous disease. According to Curran, et al., most patients who survive an initial bout with PCP will die within two years from recurrent PCP or some other infection. CDC data from early 1986 show that, on average, AIDS patients die 15 months after being diagnosed.

For the past several years, CDC officials had been estimating that about 5% to 10% of people infected with HTLV-III would develop AIDS and die. In early 1986, Dr. Harold Jaffe of the CDC said that this estimate was about to be revised upward.

Milder manifestations of HTLV-III infection

Because of the somewhat narrow surveillance definitions of AIDS as summarized in Tables I and II, both the CDC and FDA point out that only the most severe manifestations of HTLV-III infection are nationally reportable. Excluded are many less severe (that is, generally nonfatal) illnesses that are linked to HTLV-III infection.

Terms such as “ARC” (the AIDS-related complex), “AIDS-related illnesses,” “pre-AIDS” and “the AIDS prodrome” refer to these various illnesses. ARC has been defined as “a clinical and laboratory syndrome characterized by minor conditions clinically associated with immunosuppression (for example oral thrush) and laboratory evidence of immunosuppression,” including unexplained idiopathic thrombocytopenia and a variety of other fungal, viral, and bacterial infections. Among the ailments included are recurring fever, weight loss, recurring diarrhea, recurring night sweats, and PGL (persistent generalized lymphadenopathy, or “swollen glands”), which has been described as a complex of symptoms “characterized by the occurrence of persistent, unexplained lymph node enlargement in several extra-inguinal lymph node groups.” It should be noted, however, that most of these “pre-AIDS” or ARC illnesses can be caused by agents other than HTLV-III.

The CDC had been estimating that about 25% of the people infected with HTLV-III would suffer from one or more of these lesser illnesses but would not develop AIDS. This estimate was about to be revised upward in early 1986, according to Dr. Jaffe of the CDC. As of July 7, 1986, the revised estimate had not been computed (Robert Byers, CDC AIDS Branch, phone conversation).
The important consideration here, insofar as anesthetists and other health care workers are concerned, is that infection precautions are advisable with a variety of patients because, in the CDC's words, "persons with less specific or milder manifestations of HTLV-III/LAV infection may be important in transmitting the virus."^37

**Epidemiological profile and risk groups**

As of mid-January 1986, there had been 16,458 cases of AIDS in the United States reported to the CDC since the disease was identified in 1981,^31 including some cases diagnosed in the years 1978-1981.^32 About 51% of these cases were reported during 1985, and authorities expect that about 17,000 cases will be reported in 1986.\(^{33}\)

AIDS is geographically widespread. Cases have been reported from all 50 states, the District of Columbia, and Puerto Rico,^33 and its existence has been reported in about 40 other countries around the world. In the United States, 58% of all cases ever reported have been in New York (35%) and California (23%).

About 94% of the adult patients in the United States are men, most in the age group 20-49.\(^{34}\) The gender ratio of about 16:1 compares with a ratio of roughly 1:1 in African nations afflicted by AIDS.\(^{35}\)

In Haiti, where AIDS had been predominantly afflicting men, a recent study found that the virus and illness were spreading rapidly to women as a result of heterosexual transmission.^1 The study found that 30% of Haitian victims were women in 1985 (compared with 12% in 1979), and the figure was projected to be 40% by 1988, thus approaching the 1:1 ratio of Africa.

At the present time, however, most non-African nations are experiencing a distribution of AIDS that is similar to that in the United States.\(^{32,36}\)

AIDS cuts across the major racial groups in America, with about 60% of adult patients white, 25% black, and 24% Hispanic.\(^{34}\)

Of the approximately 14,200 adult male AIDS victims in the United States as of early December 1985, about 81% were homosexual or bisexual, about 14% were intravenous drug users, and the remaining 5% were in other risk groups. These

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**Table III**

**Distribution by patient group of reported acquired immunodeficiency syndrome cases, by date of report—United States, through January 13, 1986**

<table>
<thead>
<tr>
<th>Patient group</th>
<th>Before 1/14/84</th>
<th>1/14/84-1/13/85</th>
<th>1/14/85-1/13/86</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
<td>No. (%)</td>
</tr>
<tr>
<td>Adult</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homosexual bisexual men and IV drug users</td>
<td>293 (9.3)</td>
<td>418 (9.2)</td>
<td>599 (7.0)</td>
<td>1,310 (8.1)</td>
</tr>
<tr>
<td>Homosexual bisexual men not IV drug users</td>
<td>1,992 (63.0)</td>
<td>2,939 (64.8)</td>
<td>5,669 (66.5)</td>
<td>10,600 (65.3)</td>
</tr>
<tr>
<td>IV drug users</td>
<td>552 (17.4)</td>
<td>785 (17.3)</td>
<td>1,429 (16.8)</td>
<td>2,766 (17.0)</td>
</tr>
<tr>
<td>Hemophilia patients</td>
<td>17 (0.5)</td>
<td>38 (0.8)</td>
<td>69 (0.8)</td>
<td>124 (0.8)</td>
</tr>
<tr>
<td>Heterosexual contacts</td>
<td>29 (0.9)</td>
<td>53 (1.2)</td>
<td>100 (1.2)</td>
<td>182 (1.1)</td>
</tr>
<tr>
<td>Transfusion recipients</td>
<td>34 (1.1)</td>
<td>56 (1.2)</td>
<td>171 (2.0)</td>
<td>261 (1.6)</td>
</tr>
<tr>
<td>None of the above other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No identified risks</td>
<td>107 (3.4)</td>
<td>131 (2.9)</td>
<td>348 (4.1)</td>
<td>586 (3.6)</td>
</tr>
<tr>
<td>Born outside U S</td>
<td>140 (4.4)</td>
<td>114 (2.5)</td>
<td>144 (1.7)</td>
<td>398 (2.5)</td>
</tr>
<tr>
<td>Subtotal</td>
<td>3,164 (100)</td>
<td>4,534 (100)</td>
<td>8,529 (100)</td>
<td>16,227 (100)</td>
</tr>
<tr>
<td>Pediatric</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent with AIDS or at increased risk for AIDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemophilia patients</td>
<td>3 (0.9)</td>
<td>1 (0.2)</td>
<td>7 (0.8)</td>
<td>11 (0.7)</td>
</tr>
<tr>
<td>Transfusion recipients</td>
<td>6 (1.8)</td>
<td>6 (1.2)</td>
<td>21 (2.5)</td>
<td>33 (2.1)</td>
</tr>
<tr>
<td>None of the above other</td>
<td>4 (1.2)</td>
<td>1 (0.2)</td>
<td>7 (0.8)</td>
<td>12 (0.8)</td>
</tr>
<tr>
<td>Subtotal</td>
<td>51 (100)</td>
<td>48 (100)</td>
<td>132 (100)</td>
<td>231 (100)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3,215 (100)</td>
<td>4,582 (100)</td>
<td>8,661 (100)</td>
<td>16,458 (100)</td>
</tr>
</tbody>
</table>

*Includes persons born in countries in which most AIDS cases have not been associated with known risk factors

categories suggest how the victims were infected, respectively: homosexual or bisexual activity, use of infected IV needles, and unknown or other methods such as transfusions or heterosexual activity.

Of the nearly 1,000 adult women victims of AIDS in the United States as of December 1985, about 53% had been infected as a result of intravenous drug use, 15% through sexual contact with high-risk males, 10% by transfusions, and 22% by unknown means.37

Of the 227 pediatric AIDS victims in the United States as of early December 1985, three-fourths were from families in which the mother was at high risk, with a commensurate three-fourths of the pediatric patients apparently becoming infected by their mothers during pregnancy or at the time of birth or shortly thereafter.38, 39 About 18% of these 227 cases were attributable to transfusions of blood or blood products,38 and the remaining 6% were of unknown origin. About 55% of pediatric patients were black, 22% white, and 21% Hispanic, and about 58% of these children were diagnosed when less than one year old.84

Table III shows that AIDS afflicts disparate groups in America, and its presence is dramatically demonstrated. The mortality rate for AIDS patients is basically 100%.60-70 (Of all AIDS patients diagnosed before July 1984, 71% had died as of early January 1986.40)

Table III also shows that the three risk groups with the largest numbers of AIDS victims are (1) homosexual or bisexual men who do not use IV drugs (2) intravenous drug users (male and female), and (3) homosexual or bisexual men who also are IV drug users. However, Fuchs, et al.41 have concluded that, in the United States, intravenous drug users and hemophiliacs are at significantly greater risk of developing AIDS than are homosexuals. Using estimates of the sizes of the three population groups and comparing them with CDC data on the number of AIDS cases for each group as of mid-1985, Fuchs, et al. found that, compared with homosexuals, intravenous drug users are 4.6 times more likely to get AIDS and hemophiliacs are 4.2 times more likely. Fuchs, et al. acknowledge that “these risks are only crude estimates.” They then point out that “it seems unlikely, however that the numbers used, taken from reliable scientific reports, will differ so much from reality that the ranking of estimated risk would be reversed.” They also take note of the fact that the large number of homosexual victims is primarily a reflection of the number of homosexual men in America.

The Table III category of “No identified risks” includes 116 AIDS victims who had died; 24 patients who refused to be interviewed; 38 who were lost to followup; 111 for whom there was no identifiable risk; and 297 who still were to be interviewed. The 398 persons under “Born outside the U.S.” were so categorized because they were from countries where heterosexual transmission may account for the infection that resulted in AIDS. The “heterosexual contract” category consists of sexual partners of intravenous drug users (primarily women who were sex partners of infected male drug users).58

**Transmission of the HTLV-III virus**

The HTLV-III virus has been isolated from blood, semen, saliva, vaginal and cervical secretions, tears, urine, breast milk, lymph nodes, brain tissue, cerebrospinal fluid, the spinal cord, bone marrow, and cell-free plasma.15-17,37,43-46,67 However the CDC says that “epidemiological evidence has implicated only blood and semen in transmission.”4

Semen or blood can enter the bloodstream through lesions, cuts, scratches, or other open sores in body tissue. About 75% of AIDS victims in America are homosexual or bisexual men who apparently are exposed to the virus during sexual activity. There also are data showing that the virus is spread from female prostitutes (primarily those who are intravenous drug users) to their male customers and from infected men or women to their heterosexual partners.59,64,47-52

Transmission also occurs through parenteral or mucosal exposure to blood, such as the residual blood in contaminated needles shared by intravenous drug users. To a lesser extent, as Table III shows, transmission can occur when hemophiliacs or others receive transfusions of blood or blood products.

In addition, a small number of people have been infected after receiving organ transplants, such as kidneys,58, 84 and as noted earlier most pediatric patients are infected by their mothers during the perinatal period. In one pediatric case, breast milk was the suspected agent; the mother apparently had become infected by a blood transfusion following birth.58

**Unlikely methods of transmission**

In an attempt to allay the fears of health-care workers and the public at large, the CDC, in a major statement in mid-November of 1985,4 stated that the virus is not transmitted by casual, nonsexual contact with infected people in home or
work settings. For example studies of non-sexual household contacts with AIDS patients (or with infected persons) indicate that casual contact with saliva or tears does not result in transmission. There has been no evidence that the virus has been transmitted by sneezing, coughing, touching, or other casual contact with infected persons, and so far no child has been infected by contact with another child.

With regard to other possible modes of transmission, there is no evidence that the virus has been transmitted by contaminated food or water, by the airborne route, or by the oral-fecal route, or by shared use of a drinking glass or cup, or by sharing food or sharing eating utensils.

**Consequences of infection with HTLV-III**

After being infected, about two to four months are needed to complete seroconversion. For the past several years the CDC has been estimating that 5% to 10% of infected persons would develop AIDS and die and that another 25% would suffer from one or more ARC ailments; the CDC is in the process of revising these figures upward. The remaining 65% to 70%, the CDC has thought, would never become ill; this figure will decrease as the other two are increased. Ascertain the proportions of the various outcomes is difficult because of the long incubation period for AIDS—from two to five to seven years or more. However, it is known that all infected people harbor several varieties of the virus: variants of LAV, HTLV-III and ARV. No patient has been found yet who has yielded only one form of the virus.

**Surgical and diagnostic procedures**

The AIDS patient (or the suspected AIDS patient) can be subjected to a variety of operative procedures as a means of definitive diagnosis or as a way of treating the opportunistic diseases characteristic of the syndrome. The diagnostic procedures include lung biopsies, lymph node and brain biopsies, bronchoscopies, endoscopies, esophagoscopy, small bowel biopsies, and rectal exams under anesthesia. Although lung biopsy is a source of virtually definitive information on the nature of most forms of lung pathology, the proportion of AIDS-related pulmonary complications which are responsive to treatment is small, and the utility of this procedure in establishing the presence of treatable conditions in AIDS is limited.

The diagnosis of infection is achieved by a repeated positive reaction on ELISA (enzyme linked immunosorbent assay; or, to some, EIA, enzyme immunoassay), confirmed by a positive reaction on a Western blot or immunofluorescence test.

Not unheard of with AIDS patients are therapeutic procedures such as peri-anal repairs, colon surgery for carcinoma, and a variety of surgeries for recurring squamous cell cancer.

**Clinical presentation: Preoperative evaluation and management of the patient**

Clinical aspects of AIDS primarily present as opportunistic infections resulting from a deficient immune system. A review of the causative agents listed in Table I (viruses, fungi, protozoa, bacteria) makes it apparent why AIDS patients present with profound alterations of their respiratory, neurological, gastrointestinal, and metabolic systems. A complete preoperative assessment should consist of a thorough analysis of these systems plus related laboratory and radiologic tests. It is important to survey the patient's current medical regimen and to become familiar with treatment drugs in order to prevent anesthetic interactions. It also is advisable in regular preoperative assessments to obtain a family and social history in order to determine whether any risk factors for AIDS exist in the patient.

Preoperatively, it is not uncommon for AIDS patients to exhibit the so-called “wasting syndrome,” with dehydration secondary to severe weight loss, profuse diarrhea, and fever, creating an emaciated appearance. They are often moderately anemic, in a variable state of respiratory compromise, and may exhibit a variety of neurologic manifestations. Serological and immunological findings often reveal leukopenia, thrombocytopenia, and moderate anemia.

Pneumocystis carinii pneumonia occurs in about 63% of AIDS patients. It may involve fever, fatigue, malaise, shortness of breath, and a nonproductive cough. This infection may progress slowly over weeks or may progress fulminantly to respiratory acidosis and respiratory failure in a few days. Room air arterial blood gases may initially appear normal or with slight hypoxemia in a resting state, but may indicate a rise in the alveolar-arterial gradient with exercise. Chest x-rays may show bilateral infiltrates. However, gallium scans have been positive with normal-appearing chest x-rays. Because of these respiratory problems and the potential anemic state of the patient, proper oxygenation is important.

Airway management also can be a challenge to the anesthetist because of the prevalence of candida esophagitis, with potential laryngeal edema,
oral ulcerative lesions, stomatitis, and mucosal bleeding secondary to thrombocytopenia.

Fluid and electrolyte management are other important considerations with AIDS patients, especially children, because of subsequent alterations in their gastrointestinal and metabolic systems. These patients often have fever and uncontrollable diarrhea and have a weight loss of 30% to 50%. Electrolyte abnormalities are common.

Disease states can exert a variety of effects on the protein binding of drugs. Also, because of the “wasted state” of the AIDS patient, a decreased amount of anesthetic may be required. Muscle wasting also may affect the choice of muscle relaxant. Severe hypovolemia may preclude the use of a regional technique. Each patient must be assessed individually to determine the degree of debilitation at the time of surgery.

Some AIDS patients have prolonged partial thromboplastin time (PTT) with no evidence of clinical bleeding. This phenomenon appears to be secondary to an acquired anticoagulant — the lupus anticoagulant, which interferes with all phospholipid-dependent coagulation assays. This is important to note if no other history of bleeding is found in the AIDS patient, and this should not prevent invasive studies.

Alterations in the central nervous system are frequently seen in pediatric and adult AIDS patients. Common neurologic disorders such as encephalopathies, meningitis, and mass lesions may be manifest as local neurological signs or as a more generalized dysfunction such as encephalopathy dementia. Table IV summarizes a study by Shaw, et al., regarding neurologic symptoms manifested in AIDS patients of varying ages.

The data in Table IV reflect the findings of many other researchers with regard to the large proportion of AIDS patients with central nervous system abnormalities. Thus, it may be indicated to avoid anesthetic agents that have epileptogenic potential. Obviously increased intracranial pressure may be an anesthetic consideration with these patients.

With regard to the neoplastic complications associated with AIDS — Kaposi’s sarcoma (KS) and lymphomas—Masur and Macher²³ state that KS was rarely seen in the United States prior to the 1970s and primarily presented in older men of Mediterranean descent in the form of a purple nodule on the lower extremity. The KS associated with young homosexual men today is an extensive tumor that aggressively involves the lymph nodes and viscera; the incidence of the virulent form of KS has quadrupled in the past 15 years.³

Another problem in the management of the AIDS patient is the occasional existence of previously rare organisms such as cryptosporidia spp. and isosporabilli. Special medical counsel is usually needed to respond to these agents.

Occupational exposure to and infection by HTLV-III

The CDC has reported that as of August 1985 there was no evidence that HTLV-III had been transmitted through medical instruments used to examine AIDS patients.⁴ More generally, no health care worker has been known so far to have become infected during contact with AIDS patients.⁵ Yet there are many ways health care workers can be and have been exposed to the virus while working. All involve parenteral exposure or mucous membrane exposure to fluids from patients who may or may not be known to be carriers of the virus. Perhaps as many as 1,000 health care workers have experienced on-the-job exposure,⁴ and aggregate data from five studies (total N = 1,498) show that 666 workers (44.5%) had either direct parenteral or mucosal exposure.⁴

Among 361 health care workers on a CDC registry of documented exposures, the methods of exposure were: (1) 68% needlestick; (2) 13% mucosal exposure; (3) 10% cuts with sharp instruments; and (4) 9% contamination of open skin lesions.

The fluids involved in these exposures were: (1) 88% blood or serum; (2) 6% saliva; (3) 2% urine; and (4) 4% other or unknown fluids.

More than half of the exposures took place in patient rooms or wards: (1) 52% patient rooms or wards; (2) 27% intensive care units; (3) 10% operating or procedure rooms or morgues; (4) 9% laboratories; and (5) 2% emergency rooms.

A more serious matter beyond exposure is that of actually becoming infected with HTLV-III. Several studies of health care workers in America found no seropositivity in workers who were not members of a high-risk group.⁶⁻⁷ A CDC review of data on 1,758 workers who had dealt with AIDS patients turned up only three seropositive workers who were not members of a high-risk group. The CDC concluded, as did Weiss, et al.,⁷ that two of these three probably had been infected by accidental needlestick exposures to patient fluids; inadequate information on the third worker made it impossible to reach a conclusion about the cause. In England, a nurse was infected by needlestick transmission but there was resolution of her symptoms at the time her situation was reported.⁹

Despite the large number of workers who have...
Table IV
Data on 15 patients who had AIDS and encephalopathy.

Fifteen patients who had AIDS and encephalopathy were evaluated for the presence of HTLV-III in brain tissue. Clinical findings were documented before death by the patients' physicians; histopathologic findings were confirmed by a neuropathologist; and Southern analyses and in situ hybridizations were performed as described (30-32). All brain specimens were coded and analyzed independently by Southern analysis and in situ hybridization in a blinded manner; N.D., not done. Abbreviations: KS, Kaposi's sarcoma; PCP, Pneumocystis carinii pneumonia; dCMV, disseminated cytomegalovirus infection; MAI, Mycobacterium avium intracellulare; cTOX, cerebral toxoplasmosis; NHL, non-Hodgkin's lymphoma; ARC, AIDS-related complex; BTR, blood transfusion recipient; CMV, cytomegalovirus.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Sex</th>
<th>Risk factors</th>
<th>Systemic diagnoses</th>
<th>Neurologic findings</th>
<th>Neuropathology</th>
<th>Detection of HTLV-III</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>33 years</td>
<td>M</td>
<td>Homosexual</td>
<td>MAI, dCMV, PCP</td>
<td>Dementia (severe)</td>
<td>Microglial nodules (severe), CMV, gemistocytic astrocytosis (gray matter)</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>34 years</td>
<td>M</td>
<td>Homosexual</td>
<td>Oral Candida</td>
<td>Dementia (severe), paraparesis</td>
<td>Microglial nodules (severe), gemistocytic astrocytosis, perivascular lymphocytes and macrophages</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>4 months</td>
<td>M</td>
<td>Mother was intravenous drug abuser, BTR</td>
<td>PCP, oral Candida</td>
<td>Loss of developmental milestones, secondary microcephaly</td>
<td>Microglial nodules (mild), gross cerebral atrophy</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>6 years</td>
<td>M</td>
<td>Mother with ARC</td>
<td>dCMV, oral Candida</td>
<td>Loss of developmental milestones, hypertonia, ataxia, seizures</td>
<td>Gross cerebral atrophy, neuronal loss, microglial nodules</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>34 years</td>
<td>M</td>
<td>Homosexual</td>
<td>KS, PCP, MAI, dCMV</td>
<td>Dementia (moderate)</td>
<td>Microglial nodules (mild), gemistocytic astrocytosis (white matter), white matter vacuolation</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>44 years</td>
<td>M</td>
<td>Homosexual</td>
<td>KS, PCP, MAI, dCMV</td>
<td>Dementia (mild)</td>
<td>Microglial nodules (mild), vacuolar myelopathy</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>34 years</td>
<td>M</td>
<td>Homosexual</td>
<td>KS</td>
<td>Dementia (mild)</td>
<td>Healed toxoplasmosis</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>41 years</td>
<td>M</td>
<td>Homosexual</td>
<td>PCP, dCMV</td>
<td>Dementia (mild)</td>
<td>Microglial nodules (moderate)</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>37 years</td>
<td>M</td>
<td>Homosexual</td>
<td>MAI, dCMV, PCP</td>
<td>Dementia (severe), paraparesis</td>
<td>Normal brain, vacuolar myelopathy</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>8 months</td>
<td>F</td>
<td>Haitian parents</td>
<td>PCP, CMV, pneumonia</td>
<td>Loss of developmental milestones, seizures, hypertonia</td>
<td>Normal brain (terminal hypoxic change)</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>37 years</td>
<td>F</td>
<td>Intravenous drug abuser</td>
<td>PCP</td>
<td>Dementia, seizures</td>
<td>Cerebral atrophy</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>10 months</td>
<td>M</td>
<td>Mother was intravenous drug abuser, BTR</td>
<td>Oral Candida</td>
<td>Loss of developmental milestones, secondary microcephaly</td>
<td>Gross cerebral atrophy, perivascular lymphocytes</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>46 years</td>
<td>M</td>
<td>Homosexual</td>
<td>KS, PCP, dCMV</td>
<td>Dementia</td>
<td>Microglial nodules, CMV</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>43 years</td>
<td>M</td>
<td>Homosexual</td>
<td>KS, NHL</td>
<td>Dementia</td>
<td>Demyelination inflammation (non-specific leukoencephalopathy)</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>49 years</td>
<td>F</td>
<td>Sexual partner with ARC</td>
<td>KS, PCP, cTOX</td>
<td>Ataxia, seizures, dementia</td>
<td>Toxoplasmosis with necrosis and inflammation</td>
<td>-</td>
</tr>
</tbody>
</table>

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had at least one exposure, and especially despite the large percentage of workers exposed (44.5% in the aggregate), there is a low risk of on-the-job transmission and subsequent seroconversion from a single parenteral exposure. The CDC says the risk of infection following accidental needlestick is less than 1%.4

However, the anticipated large numbers of AIDS patients in coming years underscore the persistent need to be aware of the dangers and to learn job habits that can eliminate or minimize the spread of HTLV-III.

Update

This article was completed in January 1986, with a few changes made in mid-1986. As of late June 1986 between 5 and 15 million people worldwide were infected with HTLV-III; at most, about 100,000 AIDS cases have developed since the start of the epidemic.68

In the United States there have been more than 22,000 AIDS patients. Between 1 and 1.5 million Americans are infected; between 20% and 30% of them will develop AIDS by the end of 199171 and another 25% or more will suffer from ARC illnesses. The CDC projects a cumulative total of 270,000 AIDS cases in the United States by the end of 1991 (range: 201,000 to 311,000);71 by then there will have been an additional 250,000 to 450,000 patients with ARC illnesses.

A new name for the virus. An international committee has formally endorsed the term “human immunodeficiency virus” (HIV) as the preferred designation for the AIDS retrovirus in all its varieties (HTLV-III, LAV, ARV).72,73

Tuberculosis. There has been an increase in the number of tuberculosis cases associated with AIDS or HTLV-III infection.74-76 In people infected with HTLV-III, TB tends to precede, by months or years, the diagnosis of AIDS.74,75

Transmission. Many researchers believe that HTLV-III is a fairly weak virus, with transmission occurring primarily because of frequent, repeated exposures to infected or high-risk persons,80 though single-exposure transmission certainly occurs. Moreover, a CDC group has expressed a belief that transmission may be more likely from persons in the earlier stages of infection (that is, asymptomatic persons; patients with ARC sorts of illnesses). The reasoning is that such people (1) may have higher levels of circulating T lymphocytes than do AIDS patients and (2) may have higher circulating titers of the virus.77

The primary method of transmission is still sexual intercourse (homosexual, bisexual and heterosexual) of various sorts with multiple partners or with a high-risk partner (one who is infected, is exposed to an infected sexual partner, has multiple sexual partners, or shares needles for IV drug use). In the United States there is a gradually increasing percentage of cases linked to heterosexual contacts. As of early 1986 just 1% of the cases were so linked.78 One recent report said about 7% of cases now being diagnosed are linked to heterosexual contact, and the rate is projected to increase to 9% by 1991.79 Another recent report said there is agreement that this rate will increase but disagreement about the extent of the increase.79

Occupational exposure. At the end of 1985 there were almost 1,000 names on the CDC’s registry of American health care workers with documented parenteral or mucous-membrane exposure to blood or other body fluids from patients with ARC or AIDS.76 That list does not include all such workers, nor is the list representative of all such workers; however, the fact that 61% of the people on the registry are nurses is a good indication that the majority of all such exposed workers are nurses. The CDC’s review of the incidents resulting in exposure confirmed that 40% of exposures would not have occurred if recommended precautions had been followed.

Part II of this article, to be presented in the next issue, will offer a complete set of recommended anesthesia safety precautions.

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