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Human Immunodeficiency Disease: How Should It Affect Surgical Decision Making?

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Abstract

Background The ever-increasing prevalence of human immunodeficiency virus (HIV) infection and the continued improvement in clinical management has increased the likelihood of surgery being performed on patients with this infection. The aim of the review was to assess current literature on the influence of HIV status on surgical decision-making.

Methods A literature review was performed using MEDLINE articles addressing "human immunodeficiency virus," "HIV," "acquired immunodeficiency syndrome," "AIDS," "HIV and surgery." We also manually searched relevant surgical journals and completed the bibliographic compilation by collecting cross references from published papers.

Results Results of surgery between noninfected and HIV-infected individuals and between HIV-infected and acquired immunodeficiency syndrome (AIDS) patients are variable in terms of morbidity, mortality, and hospital stay. The risk of major surgery is not unlike that for other immunocompromised or malnourished patients. The multiple co-morbidities associated with HIV infection and the availability of highly active antiretroviral therapy must be considered when assessing and optimizing the patient for surgery. The clinical stage of the patient's disease should be evaluated with a focus on the overall organ system function. For patients with advanced HIV disease, palliative surgery offers relief of acute problems with improvement in the quality of life. When indicated, diagnostic surgery assists with further decision-making in the medical management of these patients and hence should not be withheld.

Conclusion HIV infection should not be considered a significant independent factor for major surgical procedures. Appropriate surgery should be offered as in normal surgical patients without fear of an unfavorable outcome.

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Introduction

There is an ever-increasing prevalence of human immunodeficiency virus (HIV) infection. Current drug therapies for this infection and its complications are prolonging the survival of patients with HIV infection [1–3], thus increasing the likelihood that surgery will be performed on these patients [1–7]. Between 20% and 25% of patients are likely to require elective or emergency surgery sometime during their illness for HIV-related pathology or incidental pathology unrelated to HIV infection [8]. This review outlines the pathogenesis of infection and analyzes available data in an attempt to provide guidelines as to how HIV status and stage of disease should affect surgical management.

Pathogenesis of HIV infection

The HIV is a member of the retrovirus family [4]. The retrovirus principally infects helper T lymphocytes, also known as CD4 or T4 cells, which normally function, via cytokines and other cellular signals, to regulate immune function. The virus gains entry into the cell via binding of the HIV envelope protein to the CD4 receptor on the cell surface. The retrovirus encodes its genetic information in RNA and uses viral enzyme known as reverse transcriptase to copy its genome into a double-stranded DNA intermediate. This is then incorporated into host DNA as a provirus [4]. Once internalized, the resulting HIV double-stranded DNA is incorporated into the cellular DNA; the virus thereafter remains quiescent for some time. Activation at a later date by some factor or factors, including other infectious agents, drugs, or cytokines, results in new viruses infecting CD4 T cells. There is a direct relation between the HIV burden, expressed as viral load, and loss of circulating CD4 T cells. In addition to HIV-induced CD4 T-cell loss, HIV infection results in significant impairment of a number of immune functions. Thus, HIV-infected individuals exhibit multiple immunologic abnormalities; neutrophil function, however, remains intact [4].

Most patients experience an acute viral syndrome several weeks following infection [4]. If measured, these patients have lower numbers of both CD4 and CD8 T cells and very high levels of circulating virus. Antiviral antibodies appear 6–8 weeks following infection. Concomitant with this appearance of antibodies is an increase in the absolute numbers of CD4 and CD8 cells, viral clearance, and resolution of the acute syndrome [4] (Fig. 1).

Malnutrition is a common complication of HIV infection and plays a significant and independent role in its morbidity and mortality [9]. Starvation and cachexia are the two major factors in the development of the HIV-related wasting syndrome, the pathogenesis of which depends on one or more factors that alter food intake, absorption, and metabolism leading to depletion of macronutrients and micronutrients [9]. Whereas total energy expenditure is not decreased with advanced HIV disease, energy supply in the form of oral intake is diminished [9]. Diarrhea, a common occurrence in HIV infection, is the main reason for malabsorption [9].

HIV prevalence

Whereas HIV transmission in developed countries is mainly homosexual, in Africa it is mainly by heterosexual transmission [10]. The hospital prevalence for HIV infection in general surgical populations varies from 0.3% to 24.0% [5, 11–14]. In 2003 in Blantyre, Malawi, HIV infection accounted for 35% of surgical admissions, 10% of whom had proven aquired immunodeficiency syndrome (AIDS) [13]. In Zambia, the HIV prevalence rate in surgical patients was 22% in 1995 [14]. In the Mwanza region of Tanzania, 11.8% of adults were infected with HIV in 1997 [15].

In South Africa, 28% of pregnant women attending antenatal services were HIV-positive in 2004 [16]. In 1996, one Durban hospital surgical intensive care unit reported that 13% of trauma patients had HIV infection [17]. In a 2006 study of surgical admissions in Durban, 72% of females and 57% of males were HIV-infected in the 25- to 35-year age range [10].

Tuberculosis co-infection

Tuberculosis co-infection is extremely common and affects not only the respiratory reserve but also the nutritional status. Between 20% and 25% of all cases of tuberculosis

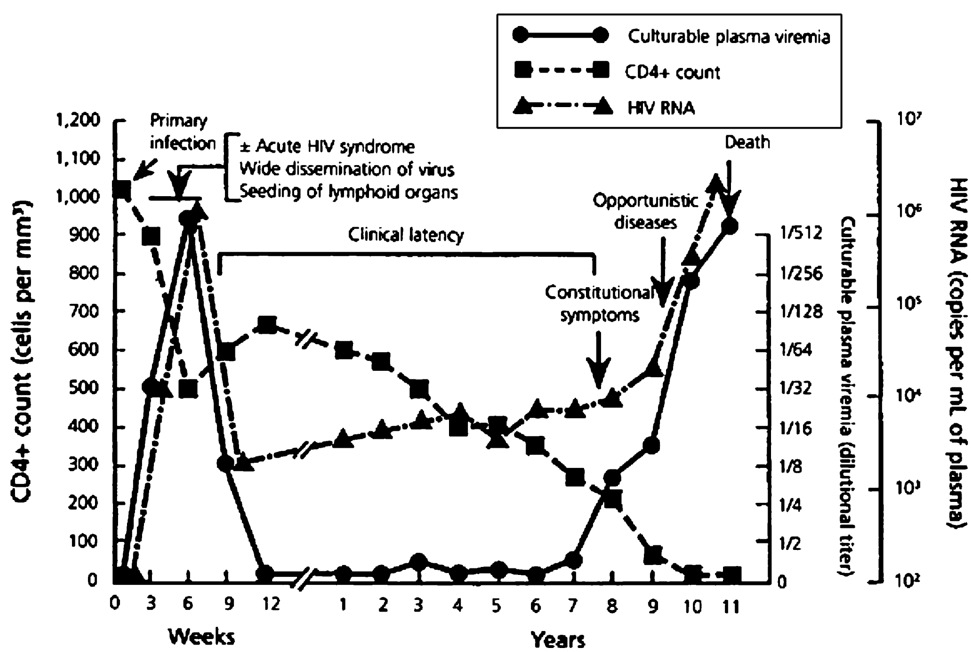

Fig. 1 Natural history of human immunodeficiency virus (HIV) infection in the average patient without antiretroviral therapy. (From Fauci et al. [74]. © Annals of Internal Medicine. Adapted with permission)

have extrapulmonary involvement, the most common sites being lymph nodes, pleura and pericardium, meninges, abdomen, skeleton, and genitourinary system, in that order [18]. Many studies in developing and industrialized countries have demonstrated a synergism between HIV and tuberculosis [18–20]. The proportion of extrapulmonary cases of tuberculosis increases if there is coexistent HIV infection [18]. In Sub-Saharan Africa 20–50% of patients with pulmonary tuberculosis and 60–90% of those with extrapulmonary tuberculosis are HIV-infected [18]. Two recent South African studies have confirmed the high prevalence of HIV infection in patients with tuberculosis [21, 22]. In severely immunocompromised patients, atypical mycobacterial infections, such as *Mycobacterium avium intracellulare* (MAI) may also cause the disease [18].

Tuberculosis presents with both generalized systemic symptoms and signs and those related to the site of involvement [18]. The assessment of peritonitis in patients with abdominal tuberculosis is complex as the differential diagnosis is broad and includes standard pathologies as well as opportunistic diseases associated with HIV infection [21].

Quantifying operative risk for the patient

Exactly what the risk is of surgery in patients with HIV infection is unknown and difficult to estimate especially as no prospective trials have examined this question, and many of the retrospective studies have yielded conflicting results [2]. There is still debate and concern regarding the evaluation and surgical management of HIV-infected patients, with some health care providers having a nihilistic attitude toward them [2]. Furthermore, there is a common perception that patients with AIDS are poor surgical risks with a high postoperative complication rate, increased need for intensive care treatment, and a high mortality rate [2].

The early reports regarding emergency surgery in AIDS patients revealed complication rates of up to 40% and mortality rates of 55–70% [2, 23]. These findings prompted some authors to advise against major surgery in the setting of AIDS [2]. In recent years, however, numerous reports have provided data that strongly contradict the poor early experience with surgery [2, 24, 25]. More recent morbidity and mortality rates are significantly lower, and most authors now agree that surgical therapy should not be withheld from patients with AIDS [2]. The problem with earlier studies was that they did not differentiate between HIV infection and AIDS. Furthermore, these studies provided incomplete information about the pathologic findings encountered at surgery and the cause of death, making it difficult to determine outcome and the surgical morbidity and mortality rates in these patients [2].

In a review of the published experience of 13 series of laparotomies in HIV-infected patients [26], the overall mortality for patients with AIDS was 30% and the overall complication rate was 46%. A careful analysis of the literature by Harris and Schecter [2] showed that the presence of AIDS-related pathology as a cause of emergency abdominal surgery confers a three- to fourfold operative morbidity risk over other causes and increases the associated average mortality from 15% to 44%. However, patients with AIDS comprise only up to 37% of patients undergoing surgery compared to HIV-infected non-AIDS patients [2]; and approximately two-thirds of HIV-infected patients with an acute abdomen suffer from non-AIDS-related pathology [2, 24, 25]. Thus, the risk to AIDS patients should not be interpreted as a risk to the total HIV-infected population.

HIV infection versus no infection

A number of studies have assessed the influence of HIV status on the outcome of surgery (Tables 1, 2). Results are variable and contradictory in terms of morbidity, mortality, and hospital stay. The presence of an intraabdominal malignancy appears to be related to the high incidence of wound breakdown in the HIV-infected group [27]. Furthermore, anorectal surgery seems to be especially predisposed to poor wound healing. Duration of survival after discharge from hospital appears to be shorter [28, 29] in HIV-infected patients, although this finding has not been supported by others [30]. It appears, therefore, that late mortality is not likely to be related to the surgical procedure but, rather, to the HIV status. Whether the introduction of highly active antiretroviral therapy (HAART) will change this chronic mortality remains to be seen.

Gastrointestinal bleeding in HIV-infected patients is associated with a poor prognosis regardless of the cause [31, 32]. The in-hospital mortality is high, and the long-term prognosis is poor because of AIDS-related co-morbidity and underlying severe immunodeficiency [31, 33]. HIV infection is associated with increased infection rates and decreased patency rates in HIV-infected patients requiring prosthetic hemodialysis access grafts, although this difference is not seen in those with autologous grafts [34]. HIV-infected patients are also at risk for thrombocytopenia, thrombocytosis and thrombophilia [35–37]; and deep vein thrombosis (DVT) in HIV-infected patients is approximately 10 times greater than in the general population and is attributed to a wide range of co-morbidities associated with HIV [38, 39].

Table 1 Studies addressing outcome in HIV-infected and noninfected patients (in developed countries)

Study	Year	Period (years)	No.	Site/category	HIV-infected vs. uninfected patients	Stage of disease (AIDS vs. non-AIDS)
Wakeman et al. [63]	1990	1	112	Anorectal	Slow wound healing in infected patients Morbidity similar	–
Safavi et al. [44]	1991	1	62	Anorectal	–	Poor healing rate with AIDS
Ayers et al. [28]	1993	10	343	Multiple	Morbidity and mortality similar	–
Binderow et al. [64]	1993	5	25	Abdominal	–	Higher mortality and longer hospital stay for AIDS
DeVito and Robinson [65]	1995	7	62	Gynecologic	Similar morbidity except blood loss (more in HIV-infected patients) Similar mortality and hospital stay	–
Yii et al. [25]	1995	8	45	Abdominal	–	More complications in AIDS patients
Hewitt et al. [46]	1996	3	57	Hemorrhoidectomy	Wound healing similar	CD4 counts had no influence on healing time
Lord [43]	1997	7	101	Anorectal	–	CD4 > 50 cells/μl → poor wound healing
Morandi et al. [30]	1999	3	48	Hemorrhoidectomy	Longer healing time in HIV infected patients Long-term outcome similar	More local complications with AIDS Longer healing time with AIDS
Curi et al. [34]	1999	4	104	Hemodialysis access	Lower prosthetic graft patency rate and more graft infection for infected patients	Infective complications similar
Tran et al. [45]	2000	1	55	Multiple	–	Morbidity and mortality similar
Davis et al. [27]	1999	10	53	Abdominal	More wound dehiscence in infected patients	No difference in wound breakdown
HIV Obstetric Group [66]	2004	10	408	Cesarean section	Postpartum morbidity higher in infected patients	–
Stawicki et al. [67]	2005	12	1173	Trauma	Higher rates of sepsis and chest complications in infected patients Mortality similar Longer hospital stay for infected patients	–
Consten et al. [47]	1995	10	1117	Anorectal		Lower CD4 counts → disturbed wound healing
Davis et al. [27]	1999	10	1060	Abdominal	More wound breakdown in HIV-infected patients	No difference in wound healing
Narasimhan et al. [52]	2004	0.5	441	Critically ill	–	No relation between CD4 count and survival
Nickas et al. [40]	2000	4	443	Critically ill	–	Poor long-term survival for CD4 < 50 No influence on in-hospital mortality
Horberg et al. [29]	2006	6	704	Multiple	Morbidity similar except pneumonia (more in infected patients) Hospital stay similar	Morbidity higher for CD4 < 50 No trend for CD4 > 50
Nadal et al. [68]	1999	8	1860	Anorectal	No difference in healing	AIDS patients took longer to heal
Dua [42]	2007	7	477	Multiple	–	Higher morbidity in AIDS patients

HIV human immunodeficiency virus, *AIDS* acquired immunodeficiency syndrome

Only parameters with significant difference are indicated as more or less

Table 2 Studies addressing outcome in HIV-infected and noninfected patients (developing countries)

Study	Year	Period (months)	No.	Site/category	HIV-infected vs. uninfected patients	HIV-infected vs. AIDS patients
Bhagwanjee et al. [17]	1997	6	402	All disciplines	Organ failure more common in infected patients Hospital and ICU stay similar	–
Jjuuko and Moodley [69]	2002	12	270	Gynecologic	Higher wound sepsis in infected patients	–
Lewis et al. [13]	2003	1	445	Multiple	No difference in hospital stay Higher mortality for HIV-infected patients	–
Mkony et al. [70]	2003	NS	NS	Multiple	Higher mortality for infected patients	–
Čačala et al. [10]	2006	12	550	Multiple	Similar morbidity, mortality, and hospital stay	Similar hospital stay CD4 count → no influence on hospital stay
Doumgba et al. [71]	2006	12	207	Multiple	More wound infections in infected patients	–
Martinson et al. [72]	2007	NS	537	Multiple	Morbidity and hospital stay similar	–
Ramogale et al. [73]	2007	56	378[a]	Obstetric	Higher mortality among HIV-infected patients	–

Only parameters with significant difference are indicated as more or less. Only statistically significant differences are noted

[a] Maternal deaths only

Critically Ill patients

Admission of patients to the intensive care unit (ICU) is an area of concern for the medical profession. ICUs are sophisticated units, and admission to these units is costly; it is imperative for health care workers to consider the prospect of survival of patients considered for admission to these units. Studies have failed to show a poorer outcome in HIV-infected patients without AIDS. A 1997 study by Bhagwanjee et al. [17] showed a similar ICU mortality, and there was no increase in ICU or hospital stay for HIV-infected patients. Although there was no difference in the incidence of severe sepsis and nosocomial sepsis, septic shock was significantly more common in HIV-infected patients. Nickas and Wachter [40] reviewed 394 HIV-infected patients admitted to the ICU and noted that long-term survival rates were low; they established that predictors of hospital mortality were mechanical ventilation and the albumin level; the CD4 count did not play a role.

Stage of disease

The Centers for Disease Control defines AIDS as the development of an AIDS-defining clinical condition or a CD4 cell count of <200 cells/μl [41]. Studies of whether the stage of the disease influences the outcome of surgery have yielded conflicting results (Tables 1, 2). Some showed a higher morbidity rate for AIDS patients [25, 30, 42–44], whereas others found no difference [27, 34, 45, 46]. A number of studies have demonstrated a significantly higher wound healing rate among HIV-infected patients undergoing anorectal surgery than in AIDS patients [30, 43, 44], whereas others have shown similar wound healing [46] and wound breakdown rate [27] in HIV-infected and AIDS patients. Similarly, there was no agreement with respect to mortality or hospital stay in HIV-infected non-AIDS patients and AIDS patients.

Studies assessing the role of CD4 counts in predicting wound healing have drawn conflicting results. Whereas Consten et al. [47] observed that lower CD4 counts in HIV-infected patients were associated with poor wound healing, other authors have shown no correlation between wound healing and the preoperative CD4 count [27, 46]. In the study by Čačala et al. among HIV-positive admissions, the hospital mortality, hospital stay, and severity of sepsis were not related to the CD4 counts [10]. Lord [43], on the other hand, showed poor wound healing only in patients with CD4 counts of <50 cells/μl. Predictors of long-term outcome appear to be the albumin level, the need for mechanical ventilation, and the CD4 count (CD4 < 50 cells/μl is associated with poor long-term outcome) [40]. There is evidence to suggest that patients with HIV infection and specific CD4 cell depletion may also suffer from impaired wound healing [48], the reason being the low numbers of CD4 cells or poorly functioning CD4 cells [48].

T cells play an important role in the wound healing process [49]. However, when assessing the role of individual T-cell subsets, studies have had conflicting results. Some authors [50] suggested that T4 cells play no significant role in wound healing, whereas others [51] suggest that the CD4 count at the time of surgery is predictive of wound healing. Still others suggest that the CD4 count, as an isolated factor, is not predictive of wound healing [44, 46]. It is therefore not clear at present whether the CD4 cells play a role in wound healing or the CD4 count is merely an indicator of the capability of wound healing.

In the study by Nickas and Wachter [40], CD4 counts of ≤50 cells/μl were associated with significantly lower median survival after hospitalization compared to CD4 counts of >50 cells/μl. Naramsihan et al. [52] showed that patients with CD4 counts of >200 cells/μl had a better prognosis and lower hospital and ICU mortality rates. Thus, a markedly low CD4 count seems to be a predictor for mortality.

It is important to note that apart from AIDS other conditions such as severe infections can lead to low CD4 counts. Thus, in addition to being an expression of AIDS, a low CD4 count can also be secondary to other conditions such as intraabdominal infections.

Antiretroviral treatment

Randomized trials indicate that patients receiving HAART are less likely to develop opportunistic infections, including tuberculosis, by increasing the CD4 cell count and reducing the plasma HIV RNA level (viral load) with at least partial restoration of immune function and slowing of the progression of HIV disease [53–56]. Such patients require fewer admissions to hospital than patients with untreated disease [53, 54]. The use of HAART has also had a dramatic effect on the morbidity and mortality of HIV-infected individuals, with improved survival of patients with HIV-related malignancies [57, 58]. The overall survival for HIV-infected ICU patients has improved, especially among patients receiving HAART [59]; and most ICU admissions are now for disorders not associated with HIV infection [52]. Recent quality of life literature suggests that HAART is effective in improving general health [60].

HAART has been available for nearly two decades; however, access to HAART for patients in developing countries such as South Africa has been limited, the main obstacles being the high cost and the lack of health infrastructure necessary to use this complex treatment [61]. Although South Africa is at the heart of the epidemic, HAART is not as widely available as it should be and was introduced into the public sector only in 2004 [60]. According to the South African guidelines, HAART is recommended when the CD4 cell count falls below 200 cells/μl or when there is an AIDS-defining illness regardless of the CD4 cell count [62]. It is tempting to postulate that by restoring immune competence patients become better able to withstand major surgery and therefore have an improved prognosis.

Discussion

The criticism of the studies looking at the influence of HIV infection on surgical outcome is that the patients and the surgical procedures performed were heterogeneous and not randomized; studies included emergency and elective procedures and septic and nonseptic cases. Not surprisingly, therefore, these studies have reported conflicting results. A larger number of patients were collected in a shorter period in studies from Africa compared to studies in developed countries.

The factors determining perioperative morbidity and mortality are the degree of individual immunosuppression and the urgency of the surgical intervention [8, 27]. Factors shown to be highly predictive of a poor prognosis in patients with HIV infection, as with any other immunocompromised or malnourished patient, are an active opportunistic infection, serum albumin level of <25 mmol/l, and the presence of concurrent organ failure [2, 24, 25].

Current evidence suggests that although HIV disease provides a unique constellation of diagnoses and challenges to the health care provider the risk of major surgery in this population is not unlike that for other immunocompromised or malnourished patients [2]. Studies reviewed show that HIV status may be associated with delayed wound healing as with any other advanced immunosuppressive diseases (e.g., diabetes, jaundice), advanced age, radiotherapy, and immunosuppressive treatment [48]. These patients often have abnormalities of T-lymphocyte function, which results in down-regulation [48].

The clinical stage of the patient's disease should be evaluated with a focus on the overall organ system function. With the relatively good outcome of the asymptomatic HIV-infected patients appropriate elective surgery should be offered as in normal surgical patients without fear of an unfavorable outcome in these patients [25]. HIV infection should not be considered a significant independent factor for major surgical procedures [2]. However, in patients with advanced HIV disease, palliative surgery offers relief of acute problems with improvement in the quality of life. When indicated, diagnostic surgery assists with further decision-making in the medical management of these patients and hence should not be withheld.

Proposed algorithms

Because HIV disease should not preclude surgery but may lead to complications, it is best to have an algorithm for the approach to these patients. The accompanying algorithms are suggested to assist in the assessment of surgical patients. When a patient presents to hospital with suspicion of HIV infection, a standard surgical workup is suggested (Fig. 2). The patient should be counseled for HIV testing. If the patient is HIV-infected, a decision must be made as to whether this is an HIV-related disease (e.g., tumor, tuberculosis) or incidental disease (e.g., appendicitis, hernia). This step is followed by staging the disease, which is accomplished by assessing the patient's CD4 count and viral load. This has the added advantage of giving HIV-infected patients the benefit of further assessment for admission to an antiretroviral program.

For patients requiring antiretroviral therapy, consideration should be made for surgery to be delayed or modified until immune competence is restored. Malnutrition associated with HIV infection is potentially reversible and should be aggressively evaluated and treated. Although there is great variation in the nutritional requirements and modes of feeding for patients with HIV infection, it is generally accepted that any dietary regimen should provide at least the recommended dietary allowance for all nutrients [9]. The recommended ratio of caloric intake for HIV-infected patients is not different from that for normal individuals. Nutritional supplements include oral supplements, appetite stimulants, nonvolitional feeding, anabolic

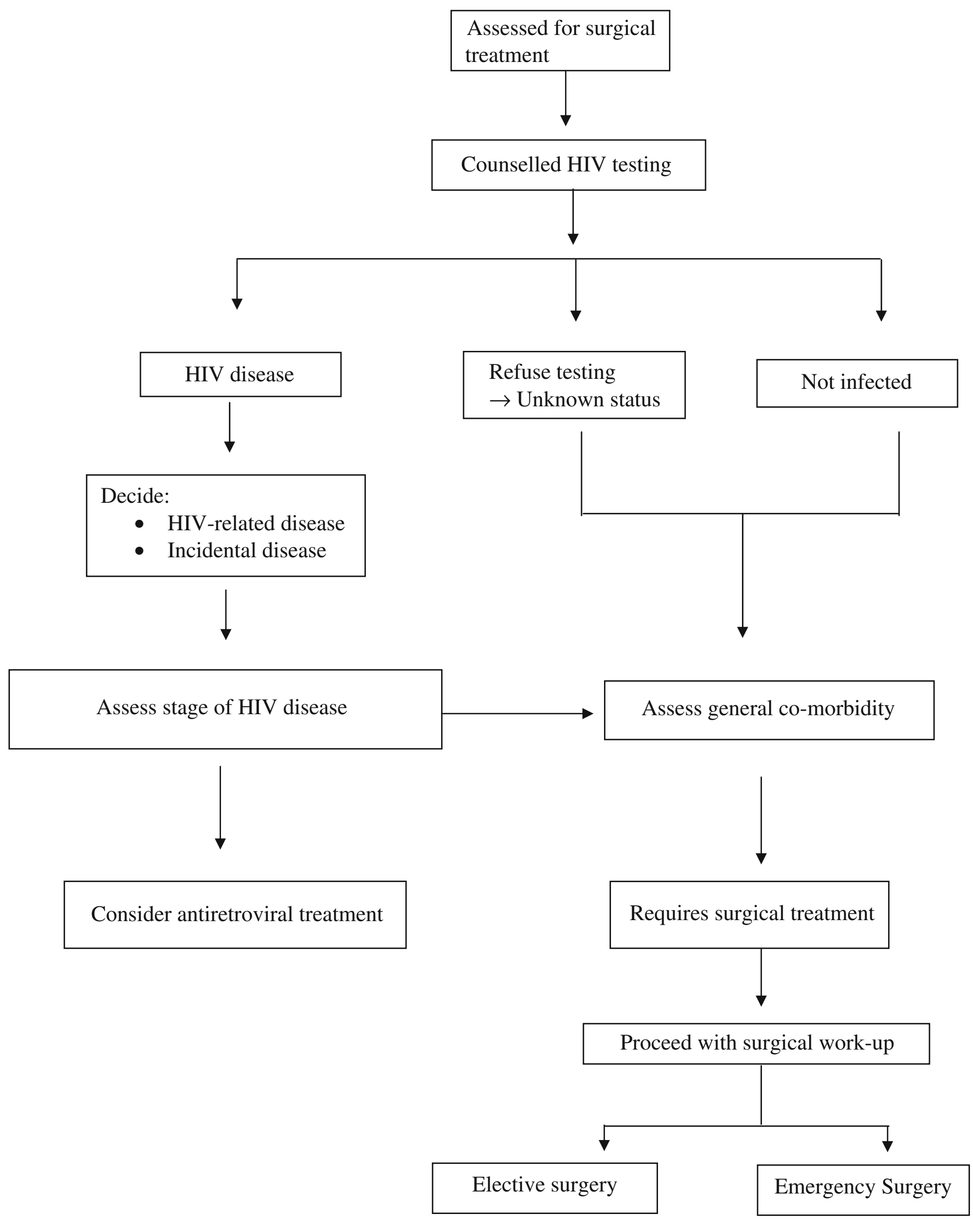

Fig. 2 Approach to management in patients presenting for surgical evaluation

agents, and cytokine inhibitors. Immune restitution can be assessed by the CD4 count and viral load. Uninfected patients and those who refuse testing (whose status unfortunately remains unknown) should be worked up for surgery in a manner similar to that for the general population, bearing in mind that one should always adhere to universal precautions.

The next step is to assess general surgical co-morbidities. Surgical co-morbidities to be assessed include cardiorespiratory problems, hematologic abnormalities, and nutritional status. Assessment of cardiorespiratory status includes chest radiography, lung function tests, and electrocardiography; and the nutritional status can then be assessed using well established parameters of recent weight loss, such as the body mass index (BMI), and albumin level.

For patients requiring elective surgery, the next step is to decide on the extent of the procedure as to whether it is a major or minor procedure (Fig. 3). Any operation that involves a laparotomy can be regarded as major. Minor operations require a less aggressive workup and can go ahead with little further workup.

For patients being considered for major surgery, the next decision is whether this is a malignant or benign condition and whether it is HIV-related or incidental. The stage of the surgical disease is then assessed and a decision made regarding the need for multimodal or neoadjuvant therapy prior to surgery. For benign conditions, the same process is followed except that there is no need to stage the surgical disease or consider multimodal or neoadjuvant therapy. Surgical intervention can then proceed. Prophylaxis and treatment of DVT should be similar to that in the general population. However, it is worth remembering that these patients have a predilection to DVT, and prophylaxis must therefore be long term.

Patients presenting for emergency surgery should be optimized to correct acute and chronic physiologic

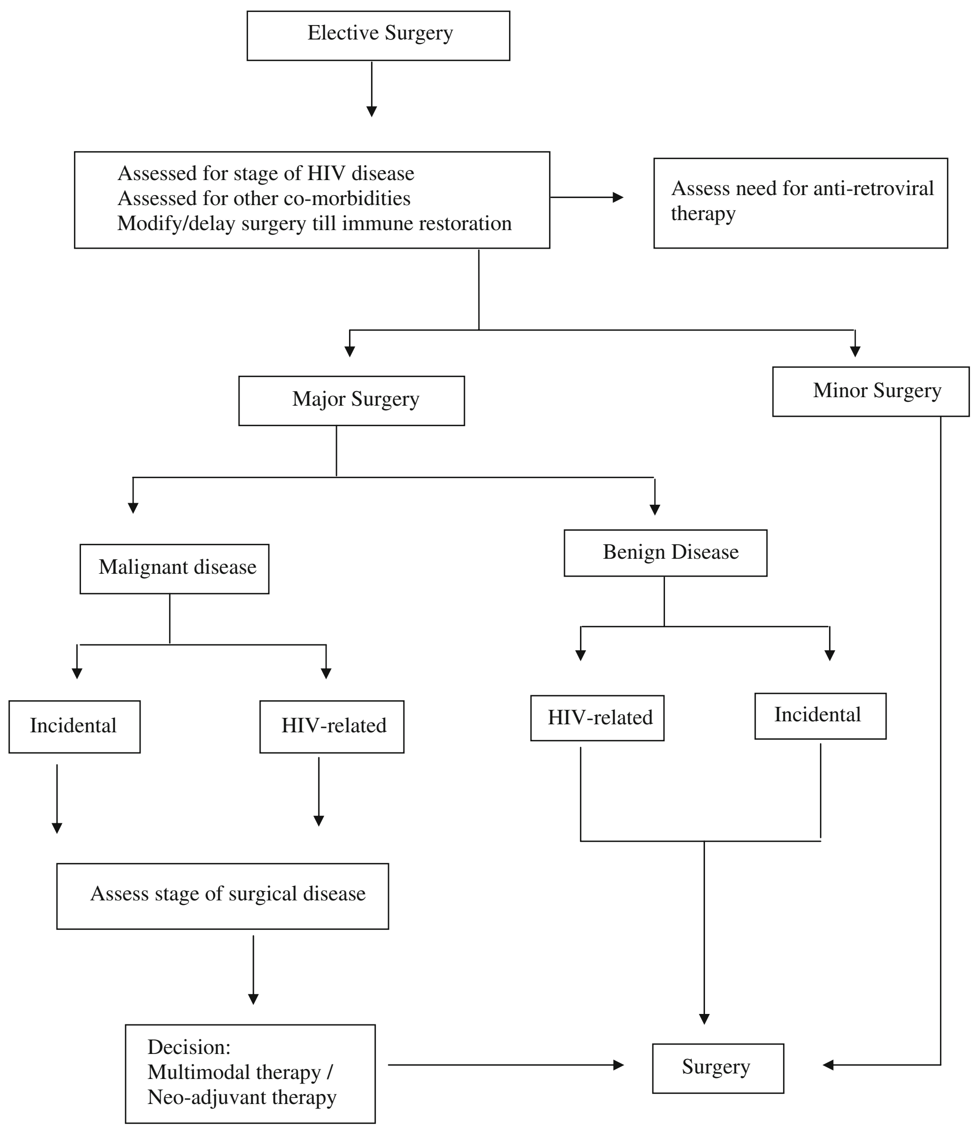

Fig. 3 Workup for patients presenting for elective surgery

derangements as time permits (Fig. 4). For major procedures, an assessment should be made as to whether time allows for optimization of the patient and the performance of the procedure on a semi-elective basis. If this is not feasible, the operation may be undertaken with the understanding that increased morbidity and mortality can be expected. During the period of optimization, a decision must be made as to whether the patient requires subsequent antiretroviral treatment. Although extremely difficult, the question of futility must always be considered. Although surgery may be technically feasible in the face of a hopeless prognosis, end of life care should be considered.

Conclusions

HIV-infected patients without AIDS-defining criteria have a surgical course similar to that of noninfected patients. The outcome following surgery, including postprocedural complications, is similar in HIV-infected and noninfected patients regardless of the site of surgery—with the exception of anorectal surgery.

The use of HIV status as a criterion for limiting surgical care has no medical basis, and HIV status alone should not be used to make decisions on surgical treatment; neither should it be used to deter or defer surgery when it is clearly

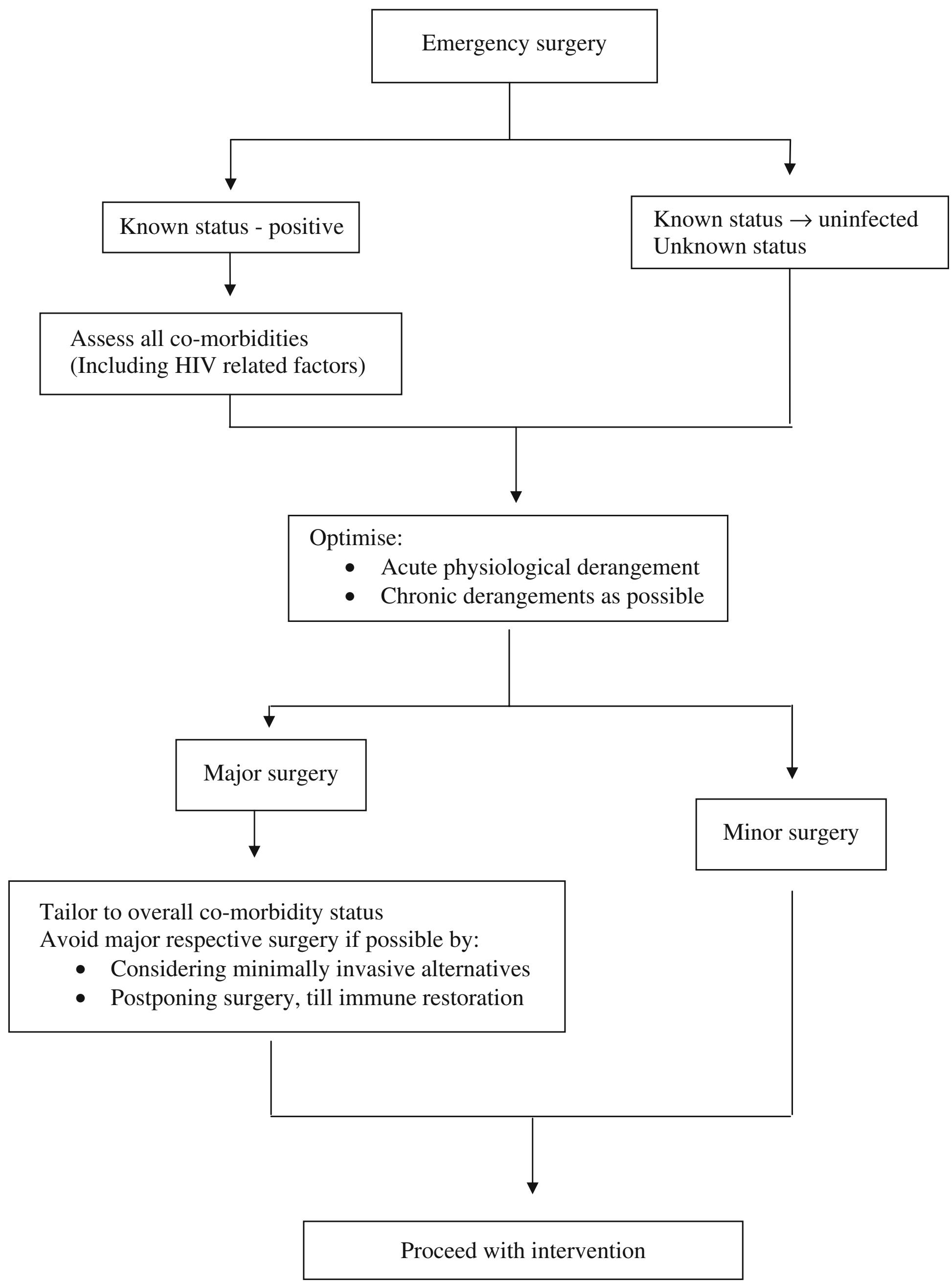

Fig. 4 Approach to patients presenting for emergency surgery

indicated or to exclude patients from admission into the ICU. By the same token, the CD4 counts in HIV-infected patients should not be used as isolated parameters on which to decide on surgical patient management. Those with very low CD4 counts are likely to be chronically ill, nutritionally depleted, often infected with pulmonary or systemic tuberculosis, and fulfill AIDS-defining criteria. It is the combination of all these factors on which decisions should be made regarding surgical intervention and its extent. We emphasize that patients should be treated on their own merit and not on their CD4 counts or viral load. However, the outcome in patients with CD4 counts <50 cells/μl is generally poor.

HIV and AIDS are risk factors for surgery and, in end-stage disease, must be considered as with any other co-morbidity; the surgery is then tailored accordingly. Analogous to aggressive chemoradiotherapy, treatment has to be modified in patients with advanced HIV infection. Patients diagnosed with HIV infection must be assessed with regard to the stage of the disease and the presence of other co-morbidities, but surgical treatment should be instituted without regard to the HIV status alone.

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