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Prevalence of HIV status and CD4 counts in a surgical cohort: their relationship to clinical outcome

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ABSTRACT

INTRODUCTION HIV positivity alone as a predictor of surgical outcome has not been extensively studied in regions of high prevalence. The aim was to determine the prevalence of HIV infection in surgical patients, and compare differences in their clinical course based on their serological status and CD4 counts.

PATIENTS AND METHODS A prospective cohort of 350 patients, enrolled over 6 weeks, were studied. HIV status was determined in all patients. HIV-positive patients had CD4 counts. Clinical details were collated with HIV data after completion of enrolment.

RESULTS Of the 350 patients, all but 6 were black South Africans. The median age was 31 years (range, 18–82 years). There were 143 trauma and 207 non-trauma patients. The male:female ratio was 1.4:1. The overall HIV seropositivity rate was 39% (females, 46%; males, 36%). Overall, 228 patients had surgical intervention and 96 patients had drainage of sepsis. The hospital stay (HIV negative, 11.9 ± 15.9 days; HIV positive, 11.0 ± 15 days) and mortality (HIV positive, 3.6%; HIV negative, 3.7%) did not differ by major diagnostic category. For HIV-positive patients, the male:female ratio was 1.2:1. There were 54 trauma and 83 non-trauma patients. An operation for the drainage of a septic focus was commoner in the HIV-positive admissions. Thirty-two (24%) patients had CD4 counts less than 200 cells/mm^3, (i.e. AIDS). The hospital mortality, hospital stay and severity of sepsis were not related to CD4 counts.

CONCLUSIONS HIV status does not influence the outcome of general surgical admissions and should not influence surgical management decisions. In HIV-positive surgical patients, CD4 counts have no relation to in-hospital outcome in a heterogeneous group of surgical patients.

KEYWORDS

HIV infection – Surgery – Outcome

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Human immunodeficiency virus (HIV) infection continues to be a major cause of morbidity and mortality in South Africa. The epicentre of the epidemic in South Africa is the Province of KwaZulu-Natal (KZN) with an annual antenatal prevalence rates of 35% in 2002 compared with the national figure of 22.4%.[1] In a Durban (KZN's largest city) public hospital intensive care unit study, conducted in 1996, 13% of trauma patients were HIV positive.[2] A steady increase in number affected by HIV is evident over the past decade.[1] The impression in South Africa is that HIV-positive surgical patients complicate more frequently and have prolonged hospital stays. However, there is a paucity of data from African surgical cohorts.[2–5]

Against this background, identification and quantification of differences in the clinical course of HIV infected and non-infected patients was assessed to determine the outcome of HIV-positive patients presenting to a South African general surgical unit. Variation in the clinical course and outcome within the HIV-positive group was assessed by stratification according to CD4 counts.

Patients and Methods

Ethical approval to conduct the study was obtained from the Ethics Committee of the Nelson R Mandela School of Medicine. A prospective anonymous linked study was conducted on 350 near consecutive general surgical admissions.

All adult surgical admissions (> 18 years) who gave informed consent were admitted to the trial between Sunday and Thursday over a 6-week period.

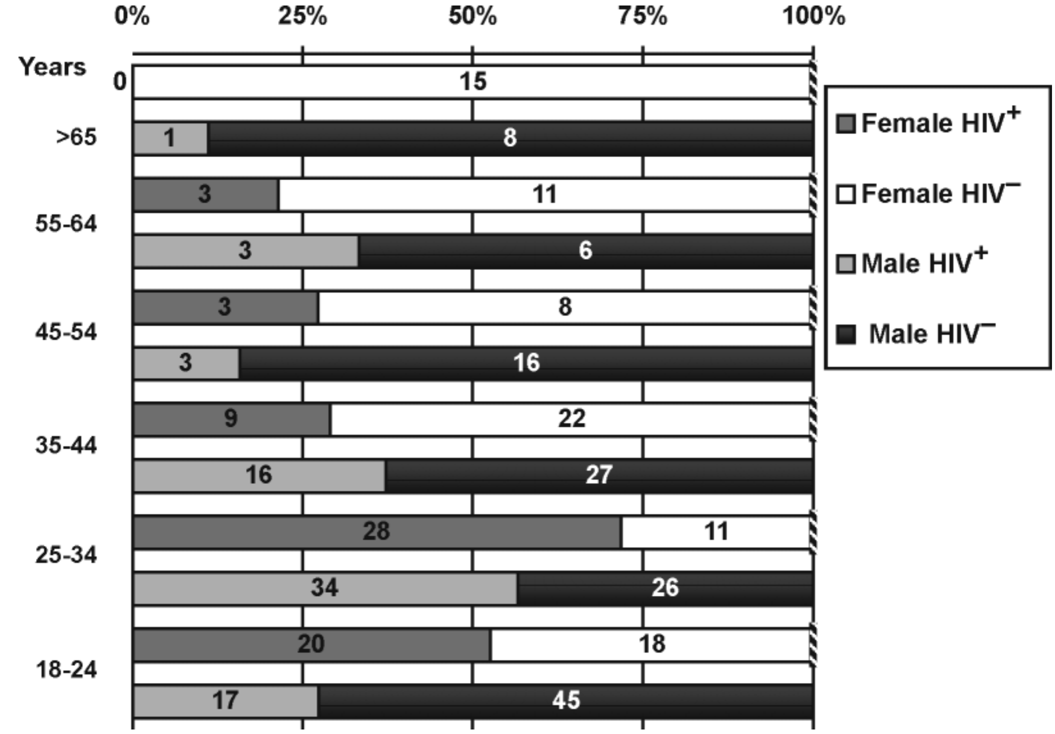

Figure 1 Age–sex–HIV distribution.

Verbal consents were obtained by two Zulu-speaking doctors using an ethically approved format. Sixteen patients declined trial participation. Friday and Saturday admissions were omitted as laboratory CD4 counts were only available during the working week.

Data were gathered prospectively. Admission details included patient demographic profile, provisional surgical diagnosis and whether admission was on the basis of trauma or not. Full blood count (FBC), urea and electrolytes results were recorded. HIV status was determined by enzyme linked immunosorbent assay (ELISA) in an automated processor using the Enzygnost kit from Dade Behring®. Positives were confirmed by a second ELISA assay using the Vironostika HIV Uni-Form II plus O kit from Biomerieux®. Only those samples reactive in both ELISAs were reported as HIV positive.

Patient progress was followed until discharge or 65 days, with documentation of operative intervention, complications, hospital outcome, duration of admission and final diagnosis. Data were bar-coded with no direct patient identification. HIV status was linked after completion of data acquisition. Positive HIV samples had CD4 count quantification.

The CD4 counts were stratified in accordance with the 1993 CDC (Centers for Disease Control) Revised Classification for HIV infection[6] into 3 groups – > 500, 200–500, and < 200 cells/mm^3 (AIDS defining).

Comparisons were made between HIV-positive and HIV-negative patient groups assessing differences in the clinical presentation, course and outcome. Comparison within the HIV-positive group with respect to CD4 counts was likewise assessed. Contingency analysis was carried out using Chi squared or Fischer's exact test.

Results

The cohort comprised 350 patients – 2 were Caucasian, 4 were of Asian descent, and the remainder were black South Africans. The age and sex distribution is shown Figure 1. The male:female ratio was 1.4:1. The age ranged was 18–82 years, with 78% of admissions under 45 years of age. Of the cohort, 39% were HIV positive (36% males and 46% females). Patients aged 25–34 years had the highest HIV positive incidence – 72% of females and 57% of males. Of admissions, 41% were trauma related of whom the majority were males.

Three HIV-positive patients had Kaposi's sarcoma, an autoimmune immunodeficiency syndrome (AIDS) defining disease. Table 1 compares HIV status and admission category (trauma or non-trauma). HIV status had no effect on hospital stay.

The range of interventions is shown in Table 2 – 72% of the HIV-positive patients compared with 62% of the HIV-negative group had an intervention. Procedures were more

Table 1 Hospital stay (days) for HIV status and admission type

	HIV+ non-trauma (n = 85)	HIV+ trauma (n = 50)	HIV− non-trauma (n = 122)	HIV− trauma (n = 93)
Mean	13.3	6.9	14.6	8.2

common in HIV-positive patients regardless of their admission type ($P < 0.050$).

Drainage or debridement of a septic focus was significantly more common in the HIV-positive when compared to the HIV-negative non-trauma patients ($P < 0.02$).

The complication rates of 20% for the HIV-positive and 15% for the HIV-negative admissions was not significantly different.

Twelve of the 13 deaths were from critical illness related to advanced sepsis or malignancy. The other death was an HIV-negative patient who had a myocardial infarction following thyroidectomy. Five deaths (3.6%) occurred in the HIV-positive group and 8 (3.7%) in the HIV-negative group. Deaths in the HIV-positive group were all non-trauma compared to 75% in the HIV-negative group.

No significant differences were noted in the FBC, urea and electrolytes measurements from the HIV-positive and HIV-negative groups.

Twelve HIV-positive patients and 16 HIV-negative patients had Hb < 8 g/dl. The anaemias were of mixed aetiology and associated thrombocytopaenia was seen only in the HIV-positive patients, one-third of whom were affected.

The CD4 counts were available for 134 of the 137 HIV-positive patients. The distribution of patients by CD4 count range is shown in Table 3.

Of the patients, 24% had CD4 counts of < 200 cells/mm^3 (AIDS defining). Patients with CD4 counts < 200 cells/mm^3 (AIDS) were about 5 years older than other CD4 count groups. No significant difference in the CD4 count groups was noted with respect to admission type.

Operative intervention was undertaken in over two-thirds of the patients and was evenly distributed between the all CD4 ranges. Duration of hospital stay was not influenced by the CD4 count. Four of the five deaths in the HIV-positive patients, had CD4 counts < 200 cells/mm^3; in the fifth, the CD4 count was 222 cells/mm^3.

Discussion

In this study, three topics were addressed: (i) the incidence of HIV infection in the surgical group; (ii) the significance of HIV infection to outcome; and (iii) the outcome in surgical patients with AIDS.

This study undertook a total approach with all surgical patients, regardless of diagnosis, being included in a prospective analysis of HIV status on the outcome surgical cohort, with trauma and non-trauma analysed as separate entities. Of surgical admissions, 39% were HIV positive in this study.

The overall incidence of HIV infection was higher in females (46%) compared with males (36%) and highest in the age range 18–34 years peaking a decade later in males. This sex difference is thought to reflect sexual contact between older men and younger women.[7] In later life,

Table 2 Operative procedures by HIV status

Procedure	HIV+	HIV−
Laparotomy	12	31
Major – other	1[a]	10[b]
Amputation	3	9
Minor	19	25
Drain sepsis	61(51%)	53 (36%)
Skin graft	7	10
Chest drain	14	24
Endoscopy	7	14
Total	124	176

[a]Vascular injury.
[b]Five vascular injuries, two mastectomies, one each craniotomy, thyroidectomy, thoracotomy

Table 3 Stratification of CD4 counts

	CD4 count (cells/mm^3)		
	< 200	200–500	> 500
Total number	32	73	29
Percentage	24	54	22
Average CD4 count	117 ± 52.5	320 ± 75.5	647 ± 120.5
Trauma number	11	31	6
Non-trauma number	21	42	23
Average hospital stay (days)	11.3	10.7	11.8
Deaths	4	1	0

Table 4 Spectrum and outcome of surgical studies on HIV and AIDS

First author (year)	Country	No	Duration (years)	Pathology	HIV^+	AIDS	Mortality (early)	Mortality (late)	Morbidity	Transmission predominance
Robinson[10] (1986)	USA	21	4	Mixed	All	All	48%	NS	NS	Homosexual
Wilson[9] (1989)	USA	35	5	Mixed	All	All	9%	46%	14%	Homosexual
Diettrich[13] (1991)	USA	88	NS	Surgery	All	48%	19%[a], 9%[b]	36%	18%	Homosexual
Whitney[15] (1992)	USA	28	7	Appendicitis	All	25%	0	NS	18%	Homosexual
Ayers[29] (1993)	USA	343	10	Mixed	All	8%	17%	61%	38%	Homosexual
Hewitt[25] (1996)	USA	57	2	Haemorrhoids	27	NS	0	NS	3 bled	Homosexual
Tran[26] (2000)	USA	55	1	Mixed	All	40%	11%	NS	24%	Drugs
Yii[28] (1995)	Australia	45	9	Mixed	All	67%	12%	35%	7% (HIV), 61% (AIDS)	Homosexual
Consten[27] (1995)	The Netherlands	83	10	Mixed anal conditions	All	68%	NS	63%	Wound[c] healing	Homosexual
Savioz[22] (1996)	Switzerland	17	7	Appendicitis	All	35%	NS	NS	9% (HIV), 50% (AIDS)	Drug
Wakeman[30] (1990)	UK	112	1	Mixed	40 (35%)	6	0	NS	6%	Homosexual
Davidson[12] (1991)	UK	28	3	Emergency laparotomy	All	All	11%	52%	NS	Homosexual
Davis[17] (1999)	UK	106	10	Mixed	53 (50%)	92%	NS	NS	Wound[c] healing	Homosexual
Lewis[4] (2003)	Malawi	486	2 weeks	All surgical admissions	175 (36%)	8%	5%	NS	NS	Heterosexual
Kalima[3] (1990)	Zambia	171	3 months	All surgical admissions	23 (14%)	13%	NS	NS	12% (HIV), 26% (AIDS)	Heterosexual
Bhagwanjee[2] (1997)	South Africa	402	1	All ICU admissions	52 (13%)	0	24%[d], 29%[e]	NS	Organ failure higher in HIV^+	Heterosexual
Wiersma[5] (2003)	South Africa	39	6	Rectal fistulae	All	NS	NS	NS	83%	Vertical MTC
This report	South Africa	350	3 months	All surgical admissions	137 (39%)	23%	4%	NS	15% (HIV), 20% (AIDS)	Heterosexual

[a]Emergency surgery; [b]elective surgery; [c]impaired in AIDS patients; [d]HIV^-; [e]HIV^+.

females are less likely to contract HIV infection as sexual relationships are less frequent and more stable.

Similar percentages of HIV/AIDS cases were evident in the trauma and non-trauma groups, suggesting that the community catchment area is likely to have a high prevalence of HIV positive residents.

One of the problems with comparing this and other data from non-industrialised countries with that from Europe and US is the non-epidemic nature of the disease in industrialised countries. In these countries, those affected are largely homosexual populations as compared to the heterosexual epidemic in sub-Saharan Africa. The spectrum of these studies is summarised in Table 4. Western series are accumulated over many years in relatively stable populations. They comprise a variable mix of elective and emergency surgical procedures. Peri-anal conditions are common and some have been receiving anti-retroviral treatment.

Surgical interventions were commoner in HIV-positive than HIV-negative admissions in this cohort which concurs with the findings in a UK study[8] where the incidence of surgical procedures in patients with HIV infection was more than twice that of the general population.

Earlier reports of surgery in HIV-positive patients were in those who had progressed to AIDS in industrialised countries.[9–11] Laparotomy mortality rates for the 'acute abdomen' due to severe opportunistic infections was between 50–70%.[10,11] Later studies showed a considerable reduction in mortality to between 9% and 19%[12,13] as increasing numbers of HIV-positive patients as well as AIDS patients were operated on. Improvements in surgical outcome not only reflect presentation at an earlier stage in the development of the disease but recognition that standard surgical therapy is still effective as reported for appendicitis.[14,15]

No difference in the complication rate between the infected and non-HIV patients admitted to our surgical unit was noted. Similarly, in a Zambian surgical unit in 1989, with a 13.6% HIV infection rate, HIV infection did not influence the outcome of general surgery and trauma patients.[3] Better outcomes have been noted particularly in HIV-positive patients without any manifestations of AIDS, where the complications were similar to those encountered in the non-infected population.[13,16,17] However, in one these studies,[16] wound healing was deleteriously affected in the HIV-positive group.

In this series, only 3 patients had clinical AIDS, although 24% had an AIDS-defining CD4 count. They presented with incidental surgical disease rather than opportunistic infections such as CMV toxic megacolon, a condition rarely seen in Africa.[18]

In this study, the mortality was low and identical in both patient groups. All HIV-positive deaths were non-trauma admissions, compared to 75% in the HIV-negative cohort. The numbers of deaths were few, so the significance of this cannot be addressed.

A variety of haematological abnormalities are well described,[19,20] and some manifested in the HIV/AIDS patients in this cohort. However, the full blood count indices were unhelpful in differentiating HIV infection from AIDS.

The progression of HIV disease is characterised by quantitative and qualitative deletion in CD4 lymphocyte counts. AIDS is diagnosed clinically when opportunist infections or tumours occur which are characteristic of severe immune suppression, or when the CD4 cell count drops below 200 cells/mm^3.

We reviewed the cases with AIDS, (on CD4 count criteria), comparing them to the HIV-infected patients without AIDS to assess if a different phase of HIV infection made a significant difference to the outcome of surgical admissions. The AIDS patients were older than other HIV-positive cases which reflects the disease progression from HIV infection to AIDS taking several years. AIDS patients did as well as other HIV-positive patients when comparing morbidity of both operative and non-operative cases.

Meta-analysis in 15 trials showed the CD4 lymphocyte count to be a a weak surrogate end-point of clinical outcome in patients on antiretrovirals.[21] More relevant for our cohort who did not receive antiretrovirals is the 9 papers, between 1991–2000, which looked at CD4 counts as a prognostic indicator of surgical morbidity for gastro-intestinal procedures. Six did not show any predictive value[13,15,22–25] and 3 found that a low CD4 count was a predictor of a poor outcome.[26–28]

Though four of the five deaths in HIV positive group had CD4 counts < 200 cells/mm^3, many patients with similar low counts successfully underwent surgery. The heterogeneity of the population studied in this cohort and the small number of deaths makes comment on the value of CD4 count, as a prognostic or management tool, speculative. Its role may be better defined in larger, more homogenous subsets of patients not possible in this study.

This study conducted in a high-prevalence HIV region defines this hospital prevalence at 39%. It shows that a quarter of HIV positive patients admitted to a general surgical service have AIDS-defining CD4 counts but are presenting with incidental conditions. Seropositive patients have a similar surgical course to the non-infected patients. We believe that our findings support our current policy that HIV positivity alone should not be used to deter or defer surgery when it is clearly indicated. This is a recommendation we believe is appropriate for surgeons in all non-industrialised nations dealing with this epidemic.

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