 DOI: 10.18231/2455-6777 .2017.0005

Management, outcome and complications of fractures in Patients Living with HIV Aids (PLHA)

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Abstract

Objectives: To determine the incidence of infection, compare the rates of infection, union and functional outcome of fractures in 5 PLHA patients with that of various previous studies, determine the correlation of various parameters with 6 complications and to determine the final outcome and approach of treatment of fractures in HIV positive patients.
Design: This is retrospective study of 70 PLHA(People Living with HIV/AIDS) patients.
Setting: Patients treated operatively at our institute are included in our study.
Patients: All the PLHA patients having fractures to be treated operatively and admitted in year 2014 are included in our study.
Intervention: The patients were managed operatively depending on fracture type and age of the patient.
Main Outcome Measurements: Infection and bony union assessed clinically and radiographically and functional outcome according to SF-12 scoring.
Results: Mean CD4 count was 452 with a range of 150 to 682. 44 patients belonged to WHO stage 1, 23 belonged to 26 stage 2 and 3 belonged to stage 3. There were no stage 4 patients in our study. The SF-12 score pattern showed gradual increment in values. Out of the 14 patients who underwent debridement post-operatively, 12 patients showed an eventual good outcome.
Conclusions: Although, HIV-positive male patients with fractures exhibited a higher incidence of wound complications and non-union compared to HIV-negative patients, almost all patients achieved satisfactory clinical and functional outcomes through correct, prompt and systematic interventions.

Keyword: PLHA, Fracture Outcomes, Complications

Introduction

India has a 'double epidemic' of musculoskeletal trauma and human immunodeficiency virus (HIV) infection, both of which affect young economically active people. HIV, an acronym that stands for Human Immunodeficiency, and the causative agent for AIDS (Acquired Immuno Deficiency Syndrome), was first recognized in 1981 and identified in 1983 by Barre-Sinoussi et al at the Institute Pasteur, Paris.(1) Despite the numerous advances made in antiretroviral therapies that reduce the viral load in the host serum and restore the numbers of host CD4 cells, there is still no cure for HIV infection nor is there a vaccine more than 30 years since the virus was first identified. As the number of AIDS mortality is declining annually due to highly active antiretroviral therapy (HAART), the patients are leading longer lives and the surgical exposure in HIV-positive patients is increasing at the same time. Trauma has no preference for HIV negative individuals and at times we treat both HIV positive and negative patients without knowing their status. There is currently limited and controversial scientific data on the incidence of complications in trauma among HIV patients. It is still not clear whether a HIV positive patient's CD4 cell count, WHO staging and or viral load influences their risk of post orthopaedic surgical complications. This review aims to clarify whether fractures should be managed any differently in HIV-positive compared to HIV-negative patients. The orthopaedic surgeon faces several challenges in dealing with trauma in HIV-positive patient namely

1. the risk of post-operative wound infection,
2. delayed fracture union,
3. risk of late implant sepsis,
4. co-existing osteoporosis, and
5. HIV transmission to the healthcare worker.

Materials and Method

This is a prospective study of 70 cases of PLHA patients (People Living with HIV/AIDS) having traumatic fracture, managed operatively. Between January 2014 to December 2014, 70 PLHA patients with traumatic fracture were enrolled in our study, which was approved by our institutional review board and followed up for a period of 1 year. Written and informed consent of each patient was taken.

Inclusion Criteria

1. Gives consent to HIV confirmation, CD4 count testing and participation in the study.
2. Patient must be ambulatory or have a normally functional limb before treatment.

Exclusion Criteria

1. Patients who have not given consent for the study.
2. Patients with Compound fractures or grossly contaminated wounds.
3. Patients with previous implant surgery on the same surgical site.

4. Patients suffering from systemic disease that may cause immune suppression.
5. Chronically debilitated or bedridden patients

Observations and Results

We have made the following observations and statistical analysis of data collected from 70 patients living with HIV- AIDS. In this study we have done analysis on fracture management, outcomes and complications in PLHAs patients. Minimum age in our study is 22 years whereas the maximum age is 80 years and average age is 44 years. Thus, majority of our patients belonged to the young active age group which is the more common age group exposed to HIV disease and trauma. Out of 70 subjects in our study there were 57 male and 13 females clearly showing that the proportion of male population suffering from HIV and trauma is significantly high compared to females. Average duration of hospital stay in fractures among PLHA is 5 days, which is no different from that in normal healthy individuals who are HIV non-reactive. In our study, the least CD4 count on which the patient was treated was 150 and the highest was 684. Average CD4 count was 452. CD4 count corresponds with incidence and prevalence of complications in PLHA. The minimum duration of HAART taken was 1 month whereas the maximum duration was 3 years before the patient was encountered for treatment. This shows that ART centres involved in management of 85 PLHA patients were quite effective in diagnosing and starting effective treatment. Most of the patients in our study belonged to WHO stage 1 and 2.None of the patients belonged to WHO Stage 4 mainly because of associated co-morbities.30 procedures performed were ORIF(Open Reduction and Internal Fixation) whereas 37 were CRIF (Closed Reduction and Internal Fixation). Externasl fixation was done in 3 patients. The procedures were individualized depending on the type of fracture and the chances of post-operative complications for each individual 90 fracture as is normally done for a non-reactive patient.

Fig. 1: CD4 count distribution

Table 1: Distribution of PLHA on basis of WHO Staging

WHO stage	Number of patients
WHO Stage 1	44
WHO Stage 2	23
WHO Stage 3	3
WHO Stage 4	0

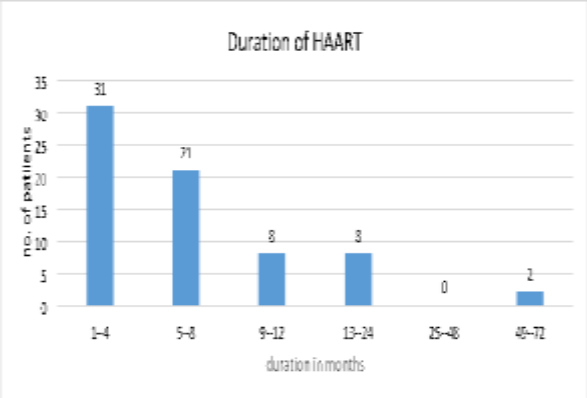

Fig. 2: Duration of HAART

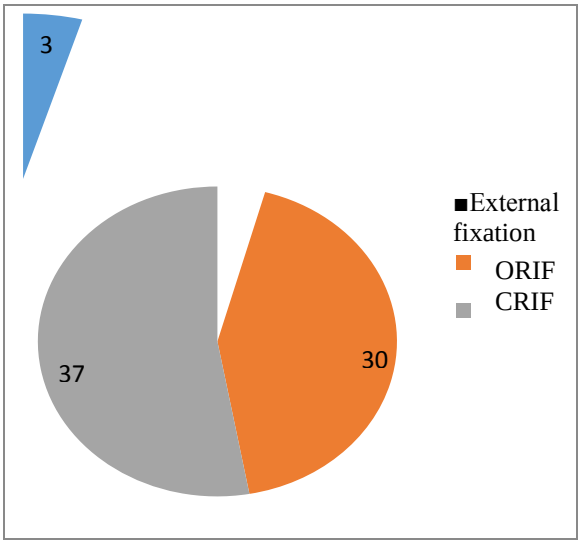

Fig. 3: Surgical procedure

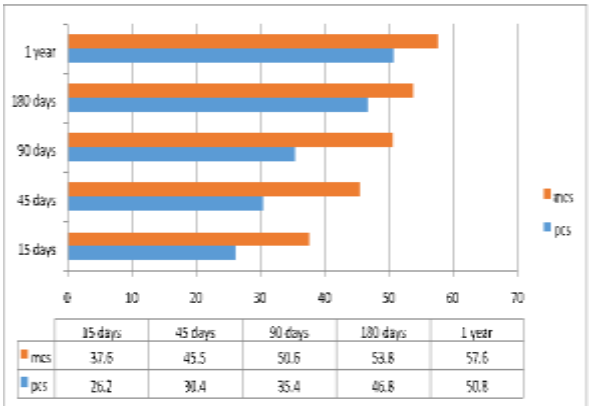

Fig. 4: SF12 Score comparison

Results are expressed in terms of SF-12 comparison[2,3] which includes two meta-scores using a complex algorithm: the Physical Component Summary (PCS) and the Mental Component Summary (MCS). In our study, we have calculated average SF-12 scores at regular intervals post-operatively (15 days, 45 days, 3 months, 6 months and 1 year). The score pattern has shown gradual increment in values at these intervals. For the MCS score, the increase is almost proportionate at all the intervals while for PCS score, the increase is observed more between 3 months to 6 months as this is the time which is usually taken for the fracture to unite and for the patient to ambulate freely without pain and discomfort. At the end of 1 year, average MCS score is 57.6 and the average PCS score is 50.8 thus showing an above average health status at the end of 1 year.

Complications

Infections: Out of 70 patients in our study, 14 patients had post-surgical infections. Out which 10 had early infections post-operative (less than 3 months) and 4 patients had delayed infection.

Debridement was done in all patients out of which 8 had good outcome, 4 patients required additional implant removal after union occurred while 2 patients had poor outcome which necessitated implant removal, external fixator and progression to chronic osteomyelitis.

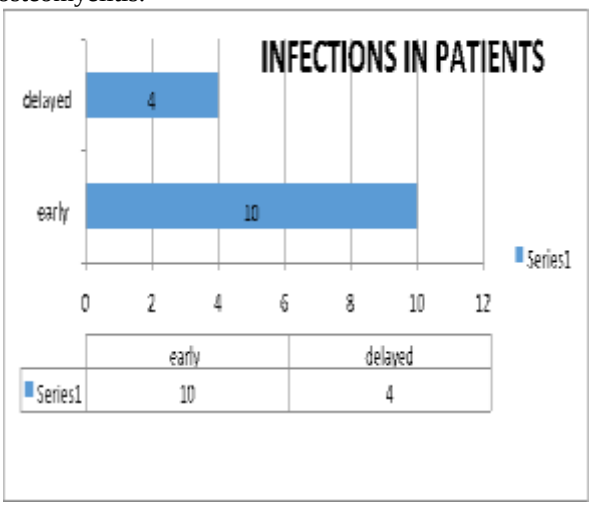

Fig. 5: Infections in patients

Table 2: Re-surgery and outcomes

Re-Surgery	Good outcome	Poor outcome	Total
Debridement	8	0	8
Debridement plus implant removal	4	0	4
Implant removal plus fixator	0	2	2

Union: Healing and union were described as sufficient callous formation, no further displacement, and no local tenderness. In addition to this, the patients must be able to bear weight fully on the affected limb (lower limb) or use the limb with full range of motion without any pain or discomfort(upper limb). 3 patients had non-union while 1 patient had delayed union.

For delayed union, isolated bone grafting was done while for non-union, ORIF and bone grafting was done.3 out 4 patients showed good final outcome whereas 1 patient in whom revision ORIF and bone grafting was done had a 128 poor outcome.

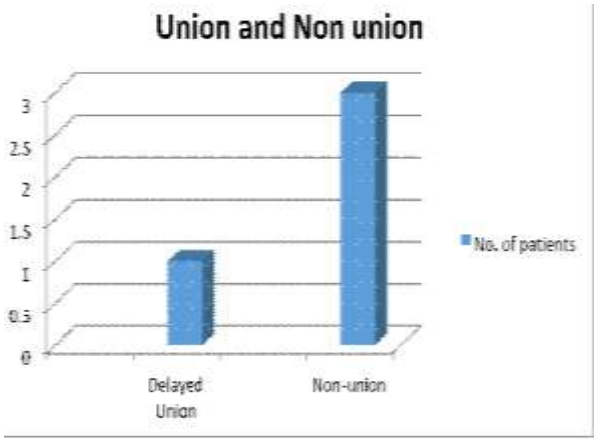

Fig. 6: Union & Non-union

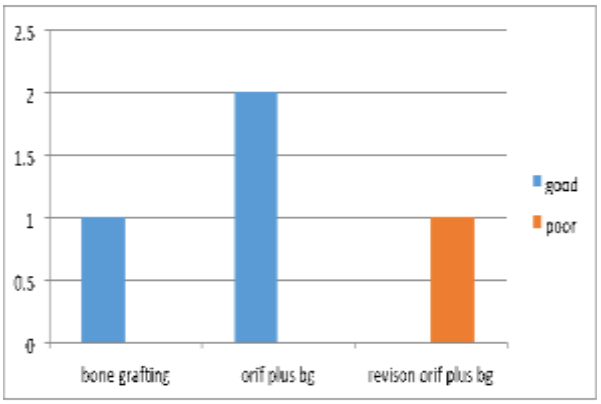

Fig. 7: Secondary Bone grafting

Revision Surgery: In all, 18 patients out of 70 required revision surgery. Out of which 15 had an eventual good outcome at 1 year whereas 3 had a poor outcome. Table 2- Final outcomes of revision surgery.

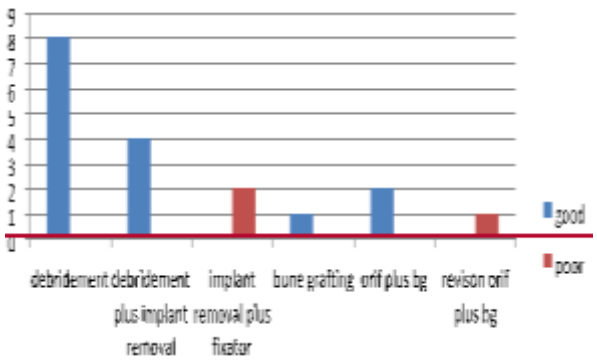

Fig. 8: Final outcomes of revision surgery

Discussion

Management of fractures in PLHA patients is a challenge because of lack of definite evidence regarding the principles of treatment. Even after 3 decades of HIV being discovered, it is still not clear as to what factors influence the outcome of fractures. It is still not clear whether a HIV positive patient's CD4 cell count, WHO staging and or viral load influences their risk of post orthopaedic surgical complications The orthopaedic surgeon faces several challenges in dealing with trauma in HIV-positive patient namely

1. the risk of post-operative wound infection,
2. delayed fracture union,
3. risk of late implant sepsis,
4. co-existing osteoporosis, and
5. HIV transmission to the healthcare worker.

The mean age in our study was 44 years thus indicating that the majority of the population affected were belonging to the young, economically active stage. This necessitates the importance of the study, which covers a significant amount of population having epidemiological, financial and overall impact on the country. In a study conducted by Abalo et al (2005),[4] the mean age of the patient was 27 with range from 18 to 47. There were 57 male patients in our study and 13 female patients. This is correlating with the proportion of males that are affected with HIV as compared to females. In a study done by Abalo et al,[4] the ratio of male: female was 4:1. The minimum CD4 count on which the patient was operated was 150 whereas the maximum was 684. In our patients, 44 patients belonged to stage 1 and 23 belonged to stage 2. None of the patients belonged to stage 4, mainly due to associated co-morbidities, which is an exclusion criteria for our study. Majority of the complications occurred in patients having lower CD4 counts or counts less than 300. This correlated with WHO Staging of HIV patients. In a study by Guild, Moore, Barnes and Herman,[5] 85% of the patients who had post-operative infection had CD4 count of less than 300. The minimum duration of HAART taken was 1 month whereas the maximum duration was 3 years. Duration of HAART treatment taken before undergoing surgery also has an influence on the incidence of complications and the development of osteoporosis. Moreover, all the patients were actively counselled and taking treatment. This shows the effectiveness of ART centres and NACO in reaching and managing the problems associated with PLHA patients. In a study by Abalo et al, only 40% of the patients had taken HAART treatment prior to trauma. The Short Form-12 Health Survey measures generic health concepts relevant across age, disease, and treatment groups. It provides a comprehensive, psychometrically sound, and efficient way to measure health from the patient's point of view by scoring standardized responses to standard questions.[2,3] In our study, the average SF score has increased gradually from 15 days post-operative to 1 year post-operative. At the end of 1 year, both the PCS and MCS are more than 50, thus showing that the final functional outcome is as good as that of the normal population. The incidence of post-operative infection is divided on the basis of early, delayed and late. Giulieri et al. (2004)[6] have earlier been classified the onset of infection after implementation into three categories as: early (less than 3 months), delayed (between 3 to 24 months) and late (after 24 months). Based on this classification, the onset of infections in our patients in this study were as follows: 14.1% early, 5.7% delayed. Several international studies carried out in the past show contrasting evidences regarding the outcome of fractures in PLHA patients. Some studies reported an increased incidence of post-operative complications in HIV patients whereas others proved otherwise. Examples: In a Study by Abalo A et al. The median follow-up period was 27 (range, 19-41) months. Of the 36 patients, 14 (39%) developed surgical wound infections (4 were deep and 10 superficial). 89% and 67% of them were in HIV clinical category B. 12 of these infections resolved after debridement and prolonged antibiotic treatment, and 2 developed chronic osteomyelitis. Four of the patients had non-union. According to Abalo et al, the clinical stage of HIV positive patients undergoing surgery influences the outcome of their surgical procedures.[4] In a study by Guild GN, Moore, Barnes, Herman,[5] out of the 64 patients, 15 had postoperative infections develop with an infection rate of 23%, compared with the 3.9% rate for the historical control subjects. Analysis of the 64 patients who were HIV positive revealed CD4 counts less than 300 were associated with development of postoperative infection. Hospital stay, poly trauma, and low serum albumin also were found to be associated with postoperative infection. Hoekman et al.[7] found early postoperative infection rates of 5%, 0%, and 23% after open reduction internal fixation in 171 patients who were HIV negative, 26 patients who were asymptomatic and HIV positive, and 17 who were symptomatic and HIV positive, respectively. The increased rate of infection in patients who were symptomatic and HIV positive was attributed to lack of prophylactic antibiotics and the degree of immune

suppression. Bates[8] reported that there was no significant difference in the rate of infection between HIV-positive and HIV-negative patients (4.2% vs 6%, respectively; p = 0.65) undergoing internal fixation in neither clean nor contamination surgery. It was a prospective single-blind controlled study of the incidence of early wound infection after internal fixation for trauma in 609 patients, of whom 132 were HIV-positive. There was no relationship between CD4 count and infection rate. HIV status did not significantly influence the number of secondary surgical procedures (p = 0.183) or the likelihood of developing chronic osteomyelitis (p = 0.131). Thus it was concluded in his study that clean implant surgery in HIV-positive patients is safe, with no need for additional prophylaxis. However it is very important to preoperatively identify the risk factors in HIV positive patients. Kamat et al[9] conducted a study to evaluate the effects of HIV infection on fracture union. They studied a group of 2,376 patients with closed ankle fractures managed conservatively with below knee casts for a minimum of 6 weeks. The study found that 12.45% of the patients with WHO clinical stage IV HIV had non-union compared to 1.5% and 1.25% for HIV negative and HIV stages I to III patients respectively. The study also revealed that fracture union is delayed in the third group of patients with the majority of this occurring at 8 weeks following injury. This is in contrast with the first and second groups of patients in which the majority of unions had occurred at 4 weeks after injury. The authors concluded that fracture union rates decreases with disease severity. This discrepancy in union rates could be attributed to the fact that the infection alters the Cytokine environment in HIV positive patients. Cytokines are essential in fracture healing due to their role in the inflammatory phase of this process. The high prevalence of early infections in this study, may be related to inadequate disinfection procedure to eliminate microorganisms from the environment, contamination of surgical instruments and or contaminated implants. Additionally, trauma and fracture fixation using metallic implants may produce structural and functional damage to the local host tissue causing devascularization, malperfusion and infection.[10,11] Fracture union[12] may be impaired in HIV-positive individuals for several reasons, like reduced bone mineral density (BMD), increased levels of pro-inflammatory cytokines including interleukin one, six and tumour necrosis factor, development of osteonecrosis due to protease inhibitors, hyperlipidaemia, corticosteroid, alcohol and drug abuse, and Corticosteroid use which also impairs bone healing. Risk of late implant sepsis:[13] The waning immunity associated with progression of HIV is likely to lead to activation of latent bacteria already present on implants, or late haematogenous seeding of bacteria onto implants. In the short term there are no increased sepsis rates up to about one year. This implies that fractures can safely be taken to union in most cases. It is not so clear what the risk of late infection is likely to be. It is unclear whether implants should be routinely removed after fracture union in HIV-positive patients. It seems wise to remove implants that are easily accessible in certain patients after clinically staging the patient and assessing laboratory parameters. The risk of refracture after early implant removal must also be kept in mind, especially since HIV may be associated with delayed fracture union. Fixation in osteoporotic bone:[14] The causes of osteoporosis in HIV disease include low body weight, drugs such as steroids, protease inhibitors, biochemical factors involving tumour necrosis factor, abnormal vitamin D metabolism, and patient inactivity especially in the later stages. Screening for BMD should be done in patients with fragility fractures, post-menopausal HIV-infected women and HIV-infected males more than 50 years. General measures to improve BMD may be used in conjunction with fracture fixation including encouraging regular weight-bearing exercises, maintenance of adequate body weight, calcium and vitamin D supplementation, and avoiding steroid use, smoking and alcohol. In HIV-positive patients who are found to be osteoporotic, consider the use of locking plates, cement augmentation of screws, hydroxyapatite-coated pins in external fixators, longer plates to distribute load over larger area, and good bone contact to augment healing. Intramedullary nails are biomechanically superior to plates and are preferred in osteoporotic bone. We remain at the epicentre of this dual epidemic of trauma and HIV infection. While post-243 operative wound infection in compound fractures and in patients having lower CD4 counts is significantly increased, the infection rate in closed fractures is comparable to that in HIV-negative patients provided optimum surgical conditions exist. Ultimately fracture treatment must be individualised depending on the bone involved, clinical presentation and host factors, antiretroviral medication, nutritional state, and surgical facilities available. With HAART and preoperative antibiotics, the orthopaedic surgical outcome of 248 HIV positive patients approaches that of the general population. The need for implant removal after union, delay in fracture union and the influence of antiretroviral medications still need to be answered by further research. A longer period prospective study would be required to reveal a possible correlation between CD4 count, WHO staging and late surgical site infection.

Conclusion

HIV infection or AIDS should not influence the decision to choose between conservative and operative therapies. To minimize wound complications and the chances of non-union, prompt and systematic interventions such as debridement, antibiotic and nutritional support, and secondary bone grafting should be undertaken to address any complication after

recognizing one. Although, HIV-positive male patients with fractures exhibited a higher incidence of wound complications compared to HIV-negative patients, almost all patients achieved satisfactory clinical and functional outcomes through correct management.

References

1. Barre-Sinoussi F, Chermann JC, Rey F, et al. Isolation of a T- immune deficiency syndrome(AIDS). Science 1983;220:868–71.
2. http://www.sf-36.org/demos/SF-12.html.
3. Ware JE, Kosinski M, Keller SD.SF-12: How to Score the SF-12 Physical and Mental Health Summary Scales. Boston, MA: The Health Institute, New England Medical Centre, Second Edition, 1995.
4. Abalo A, Patassi A, James YE, Walla A, Sangare A, Dossim A. Risk factors for surgical wound infection in HIV-positive patients undergoing surgery for orthopaedic trauma. J Orthop Surg. 2010;18:224-227.
5. Giulieri, S.G., P. Graber, P.E. Ochsner and W. Zimmerli, 2004. Management of infection associated with total hip arthroplasty according to a treatment algorithm. Infection, 32:222-228.
6. Guild GN, Moore TJ, Barnes W, Hermann C. CD4 count is associated with postoperative infection in patients with orthopaedic trauma who are HIV positive. Clin Orthop Relat Res. 2012;1507-1512.
7. Hoekman P, van de Perre P, Nelissen J, et al. Increased frequency of infection after open reduction of 285 fractures in patients who are seropositive for human immunodeficiency virus. J Bone Joint Surg [Am]1991;73-A:675–9.
8. Bates J, Mkandawire N, Harrison WJ. The incidence and consequences of early wound infection after internal fixation for trauma in HIV-positive patients. J Bone Joint Surg Br. 2012;94:1265-1270.
9. Kamat AS, Govender M. The effects of HIV/AIDS on fracture union. J Bone Joint Surg. British Volume, 2010 92-B(SUPP I): http://www.hivguidelines.org/clinical-guidelines/adults/perioperative-management-of-hiv-infected- patients.
10. Li X, Zhang Q, Zhao C and Zhao R. Wound Complications in HIV-Positive Male Patients with Fractures after Operation. Austin J HIV/AIDS Res. 2014;1(1):3.
11. Richardson J1, Hill AM, Johnston CJ, McGregor A, Norrish AR, Eastwood D, Lavy CB. Fracture 2healing in HIV-positive populations. J Bone Joint Surg Br. 2008 Aug;90(8):988-94. doi: 10.1302/0301 620X.90B8.20861.
12. Graham SM1, Bates J2, Mkandawire N3, Harrison WJ4. Late implant sepsis after fracture surgery in HIV positive patients. Injury. 2015 Apr;46(4):580-4.
13. Fracture fixation in HIV-positive patients: A literature review Page 40 / SA Orthopaedic 301 Journal Winter 2009.