Total hip replacements in HIV positive patients: preliminary results about 17 hips arthroplasties

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Summary

The human immunodeficiency virus infection is endemic in Africa. The introduction of the antiretroviral treatment has changed the prognosis of this disease and increase the life expectancy of the infected patients. Therefore some of these patients may need orthopedic prosthesis indicated for trauma or advanced osteoarthritis. Infection is very common in this group of patients and this risk may be increased with the use of prosthetic material. The objectives of this study were to report our experience in the current management of HIV infected patients who need prosthetic material and compared it to the literature.

Material and Methods

We have conducted a prospective study of all HIV infected patients operated for a total hip arthroplasty in our service at the Central Hospital of Yaoundé from 2007 to 2015. Patients were divided in Three group based on their CD4 count: Group A, Group B and group C. The minimum follow-up period after surgery was 3 months. Operated patients were on HAART or they were naive. The study has received approval of the internal review board of ethics of the Central Hospital of Yaounde

Results

During that 8 years, fifteen patients living with the HIV virus underwent surgery for total hip replacement. During this period, 62 Total hip replacements were performed. With a prevalence of or 27% arthroplasties. We made seventeen hips arthroplasties. There were 11 male and 4 women. The mean age was 46.5 years with 31 years being the minimum and 59 years being the maximum age. We observed 11 patients from group A, 2 patients from group B and 2 patients from group C. Avascular osteonecrosis of femoral head was the main indication for surgery. The highly active anti-retroviral therapy is one of the factors that promote osteonecrosis.
We used non-cemented arthroplaties. Complications rate at short term and mean term was comparable to the non-infected HIV patients.

Conclusion: Theses preliminary results indicate that prosthetic material can be safely use in HIV patients stables on HAART with the same results as non-infected patients.

Keywords: antiretroviral, immunodepression, human immuno-deficiency virus, osteonecrosis, hip replacement

1. Introduction

Total hip arthroplasty is one of the most common surgical procedures in the developed countries. It represented 2-30% of the surgical activity in France, Sweden and Norway in 2009. Total hip arthroplasty is one of the best mean for effective pain control and improve the quality of life of patients with advanced osteoarthritis of the hip. There is an estimated increase of 40% in the incidence of this procedure during the incoming 30 years in the age 55-64 years, and 85 years [2].

The most common Indications for hip arthroplasty are primary and secondary osteoarthritis, femoral head fracture, and osteonecrosis of the femoral head (OFH) which is found in 4.4% of patients infected with HIV [21]. The association between the osteonecrosis of the femoral head and the HIV has been described for the first time by Gooney et al. in 1990[6]. In 2000, Massur et al. have reported that asymptomatic bone osteonecrosis (ABO) is found in 4% of patients infected with the HIV mostly located at the hip [20]. Mahoney et al. in 2002 and Morse et al. in 2007 have reported that, protease inhibitors used in the treatment of HIV increase the risk of osteonecrosis [4,18,22]. Some authors have suggested that surgery using implants, in particular prosthesis shouldn't be used in regions where the HIV is highly endemic because of the supposed high risk for postoperative infections [2,3,11,12]. In the contrary, Harrison et al. from Malawi in 2002, have reported a low risk (3,5%) of surgical site infection in seropositive patients in the absence of preoperative contamination [10]. Savioz et al. have shown that the risk of postoperative infection is related to the level of the CD4 count, and the infection risk is the same in patients with CD4 count of more than 500/mm^3 as in seronegative patients [28].

Very few studies have been conducted in Africa to determine the infectious risk in patients infected by the HIV[10,12]. We have reported in Cameroon that with a prolong antibiotherapy (10 days) in the postoperative period, and the used of highly active antiretroviral therapy (HAART), the use of implants is possible in AIDS patients with a post-operative infection's rate comparable with the infection rate in seronegative patients [1]. Since 2007, we have been using this protocol in all seropositive patients followed in our service. We are reporting herein, our results in HIV infected patients with osteonecrosis of the femoral head treated by a total hip arthroplasty since 2007[4].

Material and Methods

From January 2007 to January 2015, we have conducted a prospective study in our service at the Central Hospital of

Yaoundé. Each HIV infected patient sent to our service for a total hip replacement were registered in a special file: socio-demographic information, clinical findings, radiological results were obtained, the information's about the surgical procedure, the prognosis and follow-up of the patients were saved in a computer based program specially designed for the study.

We excluded incomplete records, HIV negative patients, patients lost for follow-up or precocious death. Based on the CD4 count and the treatment received, HIV positive patients were divided into three groups. Group A: CD4 count of more than 300 and no viral treatment, group B: CD4 <300 on HAART (class III of the WHO), group C: CD4 count < 300 or WHO class IV: Patients in this group had also an opportunistic infection; this one was first managed until subsided before any surgery was done. Operated patients were on HAART or they were naive. Patients on HAART were supposed to receive the antiviral treatment at least three months before the surgery and it was continued thorough the operative period. All the patients of the three groups were placed on prolong antibiotherapy: second-generation cephalosporin as intravenous cefuroxime 1,5g for the initial dose during the induction and 750 mg every 12 hours for 10 days, associated to gentamicin 80 mg every 12 hours intramuscularly, and metronidazole 500mg intravenously every 8 hours for 10 days. Other than that the preoperative management and planning were the same as for a seronegative patient undergoing total hip replacement.

In all the patients, we used the HACTIV (scanos) prosthesis with no cement made and improved by BIOMET^{R} (France). The socket, fixation screws and plots are made of titan alloy TA6V ELI respecting the ISO 5832-3 norm. The cup is coated by porous hydroxyapatite of 150 µm on a surface of 120µm. This cup gets a stainless steel string on an equator position that can be seen during x-ray (ISO norm 5832-1). The non-cemented femoral stem is made of titanium alloy TA6V coated by 150µm of porous hydroxyapatite (ISO norm 5832-3). The angle between neck and femoral shaft is 135°.

We used a classic Morse neck 12/14, its can take different heads sizes (22,22mm, 28mm, 32mm. We have two types of couples Ultra High Molecular Weight polyethylene-polyethylene and stainless steel-polyethylene. All procedures were done under loco regional anesthesia. We used the external and trans- gluteal approach as reported by Hardinge, elevating a flap with stiches made through the bone which was used during reconstruction to improve the stability of the prosthesis. In the postoperative period, patients were admitted in the surgical

floor. Wounds dressing, physiotherapy and daily clinical check-up were done regularly.

The follow-up was clinical, biological and radiological. These follow-up were done first at 6 weeks, then 3 months, 6 months, 1 year thereafter. We used the Postel-Merle d'Aubigne score to check the functional status of the replaced hip. This score check for pain, and evaluate the range of motion of the hip and the walking capabilities of the patients [7,23,25]. Biological follow-up included C reactive protein, sedimentation erythro-cytes rate, blood cell determination and CD4 count level. Follow up X- ray were used to check a possible complication of the prosthesis especially loosening using Delee, Charnley and Gruen methods, periarticular ossifications, dislocations.

The viral Load was asked systematically but we collected a few results. The minimum follow-up period after surgery was 3 months. Statistical analyses were done using the SPSS 2012 and Epi-info 7. The study has received approval of the faculty of medicine and biomedical science committee of ethics.

2. Results

During that period, 62 patients underwent a total hip arthroplasty, from which 15 were HIV infected. There were 11 men and 4 women with a sex ratio of 11/4. The mean age was 46, 5 years with a minimum of 31 and a maximum of 59 years. We observed 11 patients from group A with range of CD4 count between 314 and 472, 2 patients in group B and 2 patients in group C with range of CD4 count respectively between 269-300 and 123-292. Table I shows the different patho-logies and opportunistic infections of patients who were generally treated before surgery.

Table I: Associated comorbidities

Infection	Number of patients	Length of treatment before surgery
Tuberculosis	**2**	**6months (cases 10,13)**
Herpes Zoster (Zona)	**1**	**1 month (case 1)**
Sickle cell	**1**	**Folic acid (case 4)**
Ovarian cyst	**1**	**Cystectomy (case 5)**

Pain and impotence were the most presenting symptoms with a delay of three years between the beginning of the HAART and the onset of the hip related symptoms. As shown on table II, Postel-Merle D' Aubigne score were less than 12/18. We obtained an average of 9/18 before surgery and 15/18 after surgery. Pain was the most common sign. The CD4 count of our patients was between 123 and 507 cells/mm^3. We had two patients from group C (cases 10,15).There was a significant variation of the CD4 count before and after surgery for the lowest CD4 count (cases 14 and 15). Most patients (82%) were found to have a stage IV osteonecrosis of the femoral head using the classification of Arlet et Ficat and this was common on the right side.

One patient had a post-traumatic osteonecrosis (case 6), one patient had an osteonecrosis due to tuberculosis discovered during surgery (case10). We made the hip arthroplasty and started treatment against tuberculosis and HIV. The evolution was favorable. One patient had tuberculosis at the time of diagnosis (case 13). He underwent tuberculosis's antibiotics for 6 months before surgery and received HAART. Another patient (case 4) with sickle cells disease had bilateral hip arthroplasty. We have waited 6 months between the two procedures. One case of Zona is also noticed (case 5).

Table II : Postel-Merle Aubigne (PMA) score before surgery.

Patients	**PMA score**			**Total**
	pain/6	**Walking/6**	**Mobility/6**	**18/18**
1	1	3	3	7
2	2	2	3	7
3	1	2	4	7
4	1	3	3	7
5	2	4	4	10
6	1	4	3	8
7	2	3	2	7
8	1	4	4	9
9	1	3	4	8
10	1	4	3	8
11	2	4	4	10
12	1	2	4	7
13	1	3	4	8
14	2	5	4	11

The external transgluteal approach of Hardinge was used in all the patients, The average time of surgery was 153 minutes with a minimum of 120 and a maximum of 240 minutes. Complications were assessed 10 days after the surgery. The length of hospital stay was between 13 days and 30 days with a mean of 17 days. The mean period for follow-up was 45 months. There was a great improvement in the PMA's score of patients after the surgery

Table III : comparison of the PMA score before and after the surgery

PATIENTS	Group	Before surgery	After surgery
Case 1	A	7	16
Case 2	A	7	15
Case 3	A	7	17
Case 4	A	7	16
Case 5	B	10	16
Case 6	A	8	13
Case 7	A	7	14
Case 8	A	9	15
Case 9	A	8	14
Case 10	C	8	16
Case 11	A	10	15
Case 12	A	7	15
Case 13	A	8	15
Case 14	B	9	16
Case 15	C	8	15
Average PMA's score		9/18	15/18

At short term, we noticed two complications; there was one case of surgical site infection (case 2) and one patient complaint of pain (case 3). The patient that had a superficial infection was managed with a debridement. The evolution was favorable. The patient complained with thigh pain evolved also favorably. The short term complication rate is 11,76%. At 45 months of follow-up, there was no dislocation neither none sign of infection nor loosening. At mean term, there was one case of aseptic loosening, 85 months after surgery; we made a revision of this arthroplasty (case 15). The Mean term complications rate is 5,88%.

Table IV: results of arthroplasties

Patients	Age (year)	Sex	Arthroplasty	complications	CD4 count(c/mm3) 0, 3, 12 months		
Case 1	50	F	R		472	450	461
Case 2	47	M	R	superficial infection	410	460	470
Case 3	50	M	L	post-operative pain	364	353	382
Case 4	49	M	bilateral		340	328	365
Case 5	37	M	L		300	380	392
Case 6	49	M	R		430	427	450
Case 7	59	M	bilateral		335	337	351
Case 8	45	M	L		410	415	501
Case 9	48	M	R		398	400	499
Case 10	53	F	R		292	366	393
Case 11	50	M	R		450	447	507
Case 12	52	M	R		437	480	502
Case 13	31	F	L		314	325	389
Case 14	32	M	R		269	390	404
Case 15	31	F	R	aseptic loosening	123	250	300

3. Discussion

In this study we have recruited 15 patients who underwent 17 total hip replacements. The male to female ratio was 2,75; Koller et al. and Scribner et al. have reported that testosterone and megestrol acetate may increase the risk of osteonecrosis in men [15,29]. This is closed to the findings of Tornero et al. in 2010" who described 13 HIV infected patients with osteonecrosis, 11 were men and 2 were female, Jeong et al. reported 5 cases in 2007, and all of them were men [13,30].

The mean age was 46,5 years and it is found in the active population. The prevalence of HIV infection in Cameroon is 4,3% and the disease is more common in men between 15-59 years. HIV infection and HAART increase the risk of osteonecrosis of the femoral head and thus have reduced the age of the total hip replacement in our country [8,14,27]. Jeong et al. have found a younger population with a mean age of 38 years. HAART has been used since the late 1990, and since that time there has been an increase in the number of aseptic osteonecrosis of the femoral head and of other systemic diseases[5,14,26]. In this study, we have a mean of 2 to 3 years from the beginning of HAART and the onset of symptoms of the hip. This may be related to the fact that HIV is a chronic infection and since the treatment is free all our patients were under treatment. This is similar to what have reported Jeong et al, 4 /5 of their patients were on HAART [13].

We have found that tuberculosis, HIV and sickle cell disease are risk factors for osteonecrosis. Cairns et al. on the contrary have reported that steroid, alcohol and radiotherapy are the main risk factor for osteonecrosis [3,16]. Mahoney has also reported that protease inhibitor are a risk factor for osteonecrosis [5,18]. Aseptic osteonecrosis is the most common orthopedic affection found in our work and it has been found in 4,4% of patients with HIV compared to the general population (0,03-0,04%) [3,18,22]. This has been linked to many factors as the activation of the tumor necrosis factor (TNF) by the HIV will inhibited the secretion of parathormon with the resulting osteopenia. Others factors include steroids, alcohol, sickle cell disease, coagulation abnormalities and HAART. Abnormal lipid profiles have been associated with the use of proteases inhibitors. Most of our patients were on HAART and may have had these abnormalities [7,18]. Especially one of our patient was under protease inhibitor for resistance (case 6).

We observed 2 patients from group B and 2 patients from group C. The functional results were comparable to the patients from group A. We observed one aseptic loosening from group C at mean term. We also observed one superficial infection and one post-operative pain in group A at short term. The CD4 count of our patients were similar to the one reported by Jeong et al. 123-507 vs 130-499cells/mm3 [13]. Current recommend-dations in the literature stipulate that patients should have a CD4 count above 500cells/mm3 to undergo surgery without complications [11, 24]. The patients in our serie had a good general status although

the CD4 count was low. The mean length of hospital stay was 17 days and is more than Tornero et al. have reported (9 days). One of the reasons for this long stay may be because many of our patients were living out of Yaoundé and the discharge was scheduled when they were fit for a long trip.

At short term, we had one case of surgical superficial site infection and one case of persistent pain which were managed successfully by our team. At mean term, we had one case of aseptic loosening which was revised. Complications rate at short term and mean term are comparable to the literature. A study in America that involved 1000 hospitals during 8 years got a global complications rate of 8,3% in HIV positive patients and 7,8% in HIV negative patients [17]. Habermann and al. got a complications rate of 25% [9]. The infection was due to the unavailability of antibiotics because of the lack of money. Our results are closed to the one of Jeong et al. and Tornero et al. who had reported no infection in their series. There are currently many studies which have reported that surgery in the HIV infected patients have the same infections rate as in seronegative patients mainly in patients with a CD4 count of more than 500cells/ml [17.21,28]. Total hip arthro-plasty in HIV infected patients can be safety realized using some safeguarding recommendations: good general status, use of prolong antibiotherapy and anti-retroviral therapy.

4. Conclusions

With the introduction of HAART, osteonecrosis of the femoral head has become more common in HIV infected patients [19]. These patients may need total hip replacement and this procedure can be safely done in patients with good general status, using a prolong antibiotherapy to avoid surgical site infection, subsequent prosthesis infection and other complications. We need to realize a multicenter study to confirm the low infection rate in HIV infected patients.

5. References

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