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Total Hip Arthroplasty in Patient with Sickled Cell Trait Ss: The Cases of 14 Patients

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Research Article

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Abstract

Osteo-articular complications of sickle cell disease are multiple but mostly dominated by epiphyseal aseptic necrosis. Conservative at the beginning, the surgical treatment becomes radical in the last stage with the performance of a total hip arthroplasty (THA). We report the case of total hip arthroplastyin a patient with sickle cell traitSSat Ordre de Malte Hospital (CHOM) in Dakar, focusing on the peri-operative complications encountered in this particular case in order to prevent them or to treat them if necessary.

This is a retrospective, mono-centric study including 15 total hip arthroplasty (THA) performed in 14 SS sickle cell patients over a 66-month period. The postero-lateral Moore mini open approach was used exclusively. The clinical evaluation was based on the Aubigné Postel-Merle (PMA) and Harris (HHS) scores and the radiographic score on the Ficat and Arlet classification. The corticodiaphyseal index as well as the Noble flare index channel made it possible to appreciate the medullary congestion and the shape of the femur.

All together, THA in Sickle Cell Disease represented 7.57% of all hip prosthetic activity during the period. The average age of patients (10 women and 4 men) was 29.06 years (18-50). The overall functional result was good and very good in 77% of cases. We observed 4 femoral fissures, an early vesicular lithiasis infection with psoas syndrome and acetabular loosening in the same patient and one death at 5 days postoperatively.

Keywords: Osteonecrosis; Tha; Sickle Cell Disease

Introduction

Sickle cell disease is the most common hemoglobinopathies throughout the world [1-3]. Aseptic necrosis of the femoral head is considered to be the cell death of the various components of the bone (bone tissue, bone marrow) if there is no infectious cause. It represents the most common orthopedic complication of sickle cell disease [4,5]. The surgical treatment is conservative or non-prosthetic at stages I, II or III of Ficat and Arlet; otherwise it becomes radical in the last stage with the performance of a THA [6,7]. The variegated bone of sickle

cell disease is liable to infections, to per and postoperative mechanical complications and to those related to anesthesia [6]. The performance of such surgery in very young patients is risky therefore; African surgeons should take it into account. The purpose of this work is to report our experience of THA in an adult sickle cell by focusing on the perioperative complications met on this particular ground, in order to propose recommendations.

Material and Methods

This is a retrospective study, single-centric bi operators (2 senior operators) with consecutive recruitment conducted between January 2011 and June 2016 at CHOM / Dakar. Included was all patients with sickle cell trait SS operated on for an THA during the period. Seven patients were excluded, including 6 with sickle cell trait AS and one with Sickle Cell Disease with post traumatic necrosis (transcervical fracture treated with DHS plate screw and presenting a secondary necrosis 5 years later). The series thus includes 14 adults with sickle cell disease including one case of bilateral THA. The patients' average age was 29.06 years (18-50). The average body mass index (BMI) was 19.14 kg/m^2 (15.06-29.39). The left hip was affected in 6 cases, the right one in 2 cases and the involvement was bilateral, more severe on the left hip in 6 patients. The average surgical time was 17 months (21 days - 43.5 months). The Moore mini open posterolateral approach was used in all patients. Uncemented THA was used exclusively. The average hemoglobin level of our patients went from 8.59 g / 100 ml before the procedure to 8.03g / 100ml on day 2 postoperatively. Five patients were transfused with an average of 1.3 red blood cells.

According to the classification of Ficat and Arlet, 9 hips were at stage IV and 6 at stage III. Both the image intensifier and small diameter rigid reamers were used. Preoperative and anesthetic planning was performed in all patients. Perioperative complications were noted. The postoperative care protocol was clinical (pain management, antibiotherapy, anticoagulant), biological (blood count postoperative control, Day 1 and Day2) and radiological (control X-ray on D1, D21, Month 2, Month 3, Month 6, year 1 then every year). Patients were assessed with a mean follow-up of 2.5 years (10-66 months). For the clinical evaluation we used PMA and HHS ratings.

Results

92% of the patients were satisfied with the results of the surgery against 8% of dissatisfaction.
According to the PMA rating, we obtained 77% good and very good results and 15% excellent results.

The medullar canal of our patients was overall reduced by necrosis with an average corticodiaphyseal index of 1.39 (0.5-5.6) (N = 0.48 ± 0.09). According to Noble's classification [8], 10 patients had a standard shape femur and 3 had a champagne flute-like femur. The mean PMA and HHS scores increased respectively from 9.64 (9-11) to 16.35 (15 -18) before the surgery and from 39.78 (30-49) to 87.35 (75 - 95) at the last follow-up.

These results are shown in Table 1 and Figure 1.

Studied factors	Results
Average Age	29,06
Average IMC	19,14
Average intervention time (years)	2,5
Preoperative PMA	9,64
Postoperative PMA	16,35
Preoperative HHS	39,78
Postoperative HHS	87,35
Corticodiaphyseal Index	1,39

Table 1: Representation of the different results.

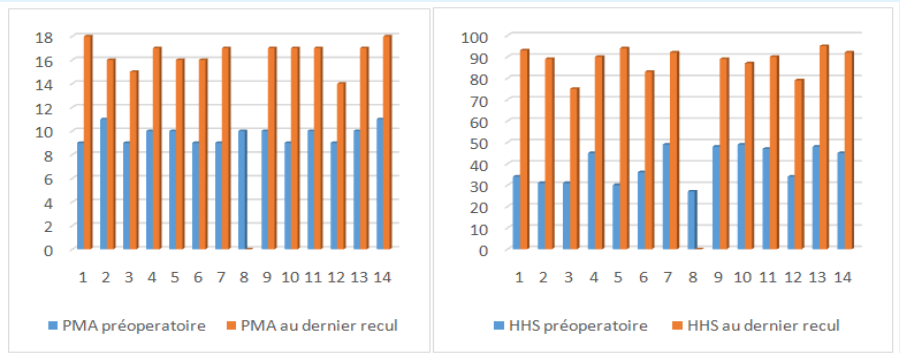

Figure 1: PMA and Harris preoperative score at the last follow-up.

Six (6) complications were found

- 4 femoral fissures according to the Barlas classification [9] (2 sitting on the calcar and 2 with an extension towards the subtrochanteric region) stabilized by strapping with deferred support. The other 2 cracks did not require any additional gesture.
- 1 death at day 5 postoperative in a disseminated intravascular coagulation table in a patient who had already received aTHA.
- Early infection on a gallbladder stone with psoas syndrome and signs of acetabular detachment in the same patient

The infection was cured by surgical lavage and dual antibiotic therapy: Imipenem 500 mg twice daily in mini infusion and phenicole (500 mg three times daily) for 30 days. Laparoscopic cholecystectomy was performed on post-THA. These complications are summarized in Table 2 and Figure 2.

Complications	Type	Number
Peroperative	femoral Fissures	4
Postoperative	Early Infection Psoas Syndrome Unipolar loosening	1
	5-day postoperativedeaths	1

Table 2: Observed complications.

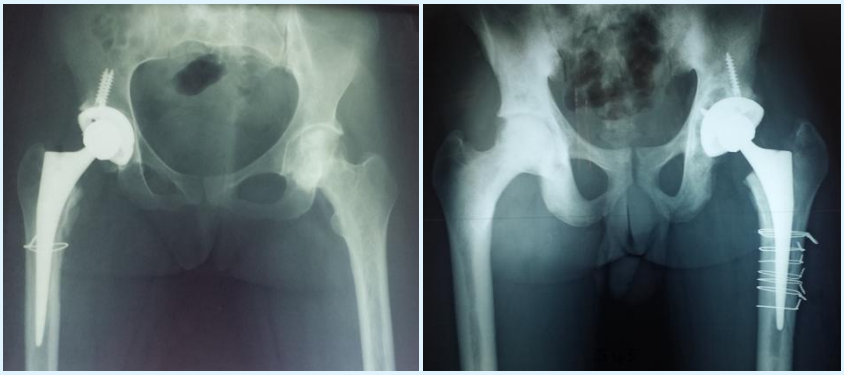

Figure 2: Postoperative radiograph showing a femoral fissure in a 20-year-old patient and a 26-year-old patient treated with a trapping.

Discussion

The purpose of this work was to report the experience of THA in Sickle Cell Disease by focusing mainly on complications.

THA was bilateral in one of our patients while 26% of SENE's patients were operated on both hip sides. The involvement of both hips is common in case of sickle cell disease [10,11]. The young age of our patients, 29.06 years on average (18-50) corresponds to most series of the literature. Homawoo found that in Togo, necrosis occurred in very young patients between the ages of 15 and 30 [12]. The 244 sickle cell patients in whom Hernigoua performed 312 THA had a mean age of 32 years [6]. All our patients were at stages III and IV at the time of the intervention. Although for some authors, surgical treatment of stage III must still be conservative [7], all agree that arthroplasty remains the only surgical treatment to be implemented in stage IV, where the collapse of the femoral head and the clinical repercussion become too much important [13-16].

The average corticodiaphyseal index of our patients was high: 1.39 (0.5 - 5.6) (N = 0.48 ± 0.09). The phenomenon of "bone within bone" in sickle cell disease is responsible for the obstruction of the diaphyseal shaft. The medullary canal is significantly reduced by endosteal bone production and apposition, which radiologically results in an increase of the corticodiaphyseal index [17,18].

The majority of our patients were underweight (6 patients) or had a normal weight range (7 patients) according to WHO criteria. In fact, sickle cell patients often have a low BMI and a low fat mass because of the hypercatabolism associated with the disease [19].

The determination of the flare index channel makes it possible to define the shape of the baffle and foretells the difficulties that can be encountered intra-operatively.

These incidents are increased in funnel-shaped femurs or in champagne flutes [20,21]. Four of our patients who had intra-operative cracks are in this register.

Sickle cell hip surgery is a real challenge for the surgeon [22,23]. Per and postoperative complications in sickle cell surgery are common in all series [11,23]. In prosthetic surgery, these complications arise as much from the anatomical changes generated by hip osteoarthritis and surgery as from the field. SENE [11] found 4 perforations of the back of the acetabulum and 8% of fractures and loosening. Rouvillain studied the complications of THA in sickle cell necrosis on 36 THA implanted in 30 homozygous sickle cell patients. He found in addition to medical complications (acute pulmonary syndrome, hemolytic crises with 4 patients sent in intensive care), 2 intra-operative fractures of the femur, a peri-prosthetic fracture, 8 loosening including 4 septic, a superficial infection, 5 patients reported, one death in post operative and another 5 months postoperatively [23].

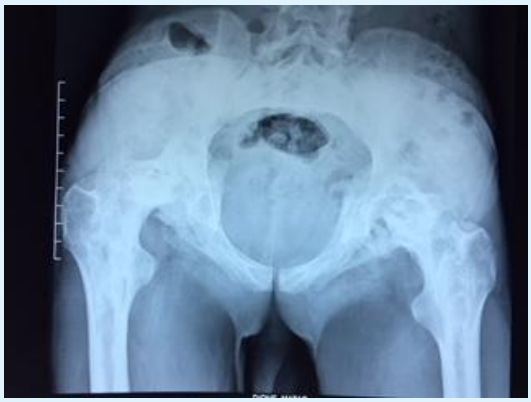

Figure 3: Pre operative Xray.

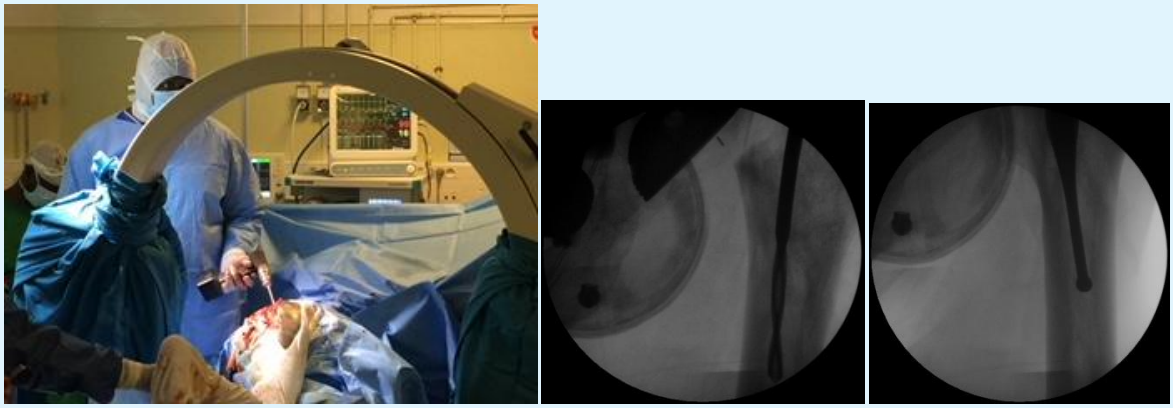

Figure 4: Use of the image intensifier, wick 6.5; a rigid reamer (Ø8 to 12) to access the canal.

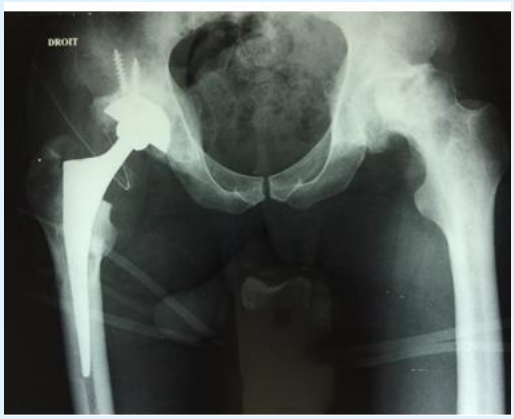

Figure 5: Post operative X ray.

For the latter, modifications of the femoral shaft must be evaluated preoperatively and careful planning is necessary with the availability of small femoral stems. Several authors agree that medullary crowding by post-necrotic endosteal bone apposition makes medullary access difficult and increases the risk of miscarriage and intraoperative fractures, and SY [16] points out that these difficulties make it necessary to resort to the cautious bore under image intensification using rigid reamers of diameter 8 or 6 and to have a wide range of implants.

Anemia is chronic in sickle cell patients because of constant haemolysis. Transfusions are related to blood loss during prosthetic surgery in relation to chronic medullary hyperplasia secondary to anemia and

difficulties in preparation of the acetabulum and femoral shaft [24,25].

Conclusion

Sickle cell osteonecrosis remains unquestionably serious because it deteriorates patients' life quality. In the last stage, THA remains the best surgical treatment most likely to bring relief and comfort to patients. A rigorous planning and multidisciplinary care is required when dealing with young patients. It can involve many complications related to either surgical or related to the sickle cell disease and patients should be informed about it. The operation difficulties on this particular field require a cautious boring of the femoral shaft under image intensifier. It is also necessary to have rigid reamers small diameter cannulated or not and a wide range of implants.

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