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## Indications and functional results after primary total hip arthroplasty in fairground surgery in Togo

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### Abstract

**Introduction:** Total hip arthroplasty is a common, well-controlled procedure. But its practice is still insufficient in low-income countries.

The objective of our work was to evaluate the functional and radiological results of patients treated during fairground surgery.

**Patients and Methods:** This series of cases concerns 31 total hip arthroplasties implanted by anterior (15) and anterolateral (16) approach on standard table, in three editions, by three surgeons. The functional assessment was made by the scores of Devane, de Postel, Merle d'Aubigné (PMA) and Harris and the level of subjective patient satisfaction, the radiographic assessment concerned the positioning of the implants.

**Results:** The perioperative complications were hemorrhagic shock (01), fractures of the greater trochanter (05), subcutaneous hematoma (07), In 05 cases of lower limb overlengthening, 2 were poorly tolerated. The Devane activity score increased from 70.97% of Grade  $\leq 2$  to 83.87% of Grade  $\geq 3$ . The PMA score had gone from 90.32% patients at most poor to 70.97% at least good, and Harris Hip Score was excellent or good in 74.19% and 96.77% had a level of subjective satisfaction excellent or good matching with the Harris. The average cup abduction angle was  $44.51^\circ$  ( $17-62^\circ$ ), 67.75% of them were in the safe zone. The femoral offset was assessable in 21 patients, 16 of whom were satisfactory. 35.48% of the femoral stems were varus. An upper anterior dislocation occurred at day-56 post-operative.

**Conclusion:** These three editions of fairground surgery present in their vast majority all the technical and technological indicators of a successful operation with a good prognosis and have enabled the return to more than acceptable physical activity for all beneficiaries.

The low hemorrhagic nature of the minimally invasive anterior and anterolateral approaches makes them an asset to acquire for our countries frequently exposed to shortages of blood to transfuse.

**Keywords:** Total hip arthroplasty, fairground surgery, results, Togo

### Introduction

Total hip arthroplasty (THA) is the prosthetic replacement of the bony elements of the coxofemoral joint. It is the ultimate ideal indication for several orthopedic, traumatic or rheumatic pathologies affecting the bony elements of this joint<sup>[1]</sup>.

Several approaches are used depending on the surgeon's habits and the specifications required for the patient. In all cases, whatever their preoperative state, the type of prosthesis and the approach used, the results are generally undeniable in 95% of patients<sup>[2, 3]</sup>.

However, current concerns are to reduce morbidity, facilitate functional recovery as well as reduce the length of hospitalization and consequently also reduce the cost<sup>[4]</sup>.

It is for this purpose that minimally invasive approaches have been developed, defined as those whose skin incision does not exceed 10 cm<sup>[4, 5]</sup>. Although their aesthetic interest no longer needs to be demonstrated, their functional interest is based on a low level of attack on all of the underlying soft tissues<sup>[4]</sup>.

On the other hand, although THA is common practice and easy access elsewhere, it still remains insufficiently practiced in low-income countries, particularly in sub-Saharan Africa, mainly because of its still very high cost and the due to the absence of universal health insurance. However, the implementation of THA has been growing significantly in recent years, with increasing demand particularly reported in Togo<sup>[6]</sup>.

Fairground hip arthroplasty campaigns involving foreign volunteer surgeons are ideal opportunities to allow applicants to benefit from them at low cost.

The objective of our work was to evaluate the short-term radiological and functional results of patients treated during fairground surgery events.

## 2. Patients and Methods

### 2.1 Patients

This was a series of cases with prospective data collection concerning 31 patients recruited and operated on by 03 different surgical teams during the first three editions of fairground hip arthroplasty organized by AIMES-AFRIQUE in Togo, in know from: November 22-26, 2017 (05 days): 08 patients; January 13-18, 2019 (06 days): 14 patients and August 12-15, 2019 (04 days): 09 patients.

None of the patients recruited and operated on these occasions was excluded from our study (Table I). Twenty-seven (87.10%) of our patients came from Lomé (City) and the other 4 (12.9%) from the interior of Togo. All socio-professional groups were represented, without particularities.

**Table I:** Sociodemographic data

		<b>n</b>
Series size		31
Average per edition		10.33 (8 -14)
Daily average		2,21 (01-04)
Average age (year)		45.67 (22 - 85)
Gender	Male	18 (58.06%)
	Female	13 (41.94%)
Sex ratio (M/F)		1.38
Average BMI (kg/m2)		25.86 (18.5 – 37.6)

The mean BMI value was 25.86 kg/m<sup>2</sup>, and 17 (55%) patients were obese or overweight, according to WHO criteria [7]. Specific patient histories are listed in Table II.

**Table 2:** Specific antecedents

	<b>n</b>	<b>%</b>
HBP	12	38.70
Sickle cell disease (SC)	02	6.45
Femoral neck fracture	02	6.45
Hip fracture-dislocation	02	6.45
Fracture of the ipsilateral femur	01	3.23
Smoking	02	6.45
Occasional use of alcohol	13	42

Preoperative ILMI (short, operated limb) were found (Table III). They are generally well tolerated for values  $\leq 10$  mm.

**Table 3:** Distribution of patients according to preoperative limb length measurements

	<b>n</b>	<b>%</b>
Isometry	17	54.84
ILMI* preoperative	14	45.16
$\leq 10$ mm	2	6.45
11 – 20mm	4	12.90
$> 20$ mm	8	25.81
Total	31	100

\*ILMI : Inequality in length of the lower limbs

The functional assessment was carried out using the PMA score and the Harris score.

With an average preoperative value of 9.16 points (range 3 and 14), the PMA score was poor in 15 (48.39%) patients, mediocre in 13 (41.93%) and fair in 03 (9.68). %).

With an average preoperative value of 47.96 points (range 4.6 and 74.7), the Harris score was poor in 29 (93.55%) patients and fair in 02 (6.45%).

### Socio-economic aspect

For an average cost of 1175 dollars (585 and 1700), eleven (35.48%) of our patients were able to fully self-finance their care. The others benefited from partial (10) or total (10) assistance from those around them.

The reasons for delays in treatment were dominated by financial difficulties mentioned 28 times (90.32%).

All patients had a standard x-ray of the pelvis and additional examinations were carried out.



**Fig 1:** Patient with a dysplastic hip

### 2.2 Therapeutic protocol

#### Type of anesthesia

Thirty (96.8%) patients were operated under locoregional anesthesia by spinal anesthesia or epidural anesthesia, and one under general anesthesia with a laryngeal mask.

The combination of installations and approaches with the technique of exposing the proximal end of the femur in position "4" (Fig.1) gave 04 different surgical approaches (Table VI) and partly illustrated by the figures 19 and 20.

**Table 4:** Distribution according to surgical approach

	<b>Installation</b>	<b>Position « 4 »</b>	<b>n</b>	<b>%</b>
Team 1	VA* in Supine*	Leg backwards	8	25.81
Team 2	VAL* en DL*	Leg backwards	14	45.16
Team 3	VA in supine	Leg forward	7	22.58
Team 4	VAL in supine	Leg forward	2	6.45
Total			31	100

\*VA : Anterior approach ; \*DL: Decubitus lateral approach

\*VAL: Antero lateral approach

The cutaneous landmarks are the anterior superior iliac spine (AISS) and the top of the greater trochanter.

The incision began two finger widths below and outside the EIAS and was made next to the muscular gap between the sartorius and the tensor fascia lata (TFL) or, more lateralized, centered on the relief of the TFL. The incision was most often minimally invasive, but sometimes had to be enlarged.



**Fig 2:** Anterior approach in supine position, femoral phase, femoral canal exposed, the operated limb in position “4” behind the healthy limb.

The characteristics of the implants are listed in the Tables V, VI, VII

**Table 5:** Characteristics of prosthetic acetabulum’s

	Size (mm)	n	%
TRINITY, CORIN®	44	3	9.68
	46	4	12.90
	48	4	12.90
	50	2	6.45
	52	8	25.81
	54	6	19.35
Muller Cup II dysplasia 10° cemented, CORIN®	52	1	3.23
Muller Cup IISTD cemented, CORIN®	46	2	6.45
Total		31	100

**Table 6:** Characteristics of the rods

Collar length	Head diamètre (mm)			Total	
	28	32	36	%	n
Short (-3.5 mm)	12.90 (4)	0	0	0	12.90 (4)
Extra short (-4 mm)	3.23 (1)	19.35 (6)	3.23 (1)	25.81 (8)	25.81 (8)
Medium (0)	9.68 (3)	12.90 (4)	25.81 (8)	48.39 (15)	48.39 (15)
Long (+4 mm)	0	0	9.68 (3)	9.68 (3)	9.68 (3)
X-long (+7 mm)	0	3.23 (1)	0	3.23 (1)	3.23 (1)
Total	25.81 (8)	35.48 (11)	38.71 (12)	100 (31)	100 (31)

**Table 7:** Characteristics of short and standard femoral stems

Brand/ Type	Size	n	%
MINIHIP CORIN®, (CCD : 130°)	Size 1	4	12.90
	Size 2	3	9.68
	Size 3	6	19.35
	Size 4	2	6.45
	Size 5	4	12.90
	Size 6	4	12.90
	Size 7	1	3.23
	Total	24/31	77.42
Brand/ Type	Size (CCD*)	n	%
METAFIX, Standard CORIN®	Size 6 (135°)	1	3.23
	Size 2 (135°)	2	6.45
	Size 3 (125°)	1	3.23
	Size 3 (135°)	1	3.23
	Size 4 (125°)	1	3.23
	Size 7 (135°)	1	3.23
	Total	6/31	19,35

CCD\*: cephalo-cervico-diaphyseal angle

**Closing**

As intraoperative bleeding is minimal, intra-articular drainage has never been necessary. Closure was done in three planes: suture of the TFL aponeurosis, then, the subcutaneous and cutaneous planes. Surgical details are summarized in Table VII

**Table 8:** Surgical details

	Values
Size of incisions (scars)	8.93cm (5 – 15)
Minimally invasive-(≤10cm)	22 (70.93%)
Macro-invasive	09 (29.07%)
Average blood loss (TH)	3.6 g/dl (1, 51 – 6, 1)
Blood transfusion	05 (16.12%)
Overall average operating time (minutes)	87 (55-148)
Anterior approach	83.2 (55-135)
Anterolateral approach	91.75 (65-14)

**2.3 Postoperative protocol and follow-up**

Antibiotic therapy and analgesia were administered systematically unless there was an anesthetic

contraindication. Anticoagulant prophylaxis with enoxaparin lasted on average 07 days. An fluoroscopy check was systematically carried out at the end of the procedure.

**Substantial functional rehabilitation had been initiated**

The functional evaluation of the patients was carried out by questioning, measurements and clinical tests using the Postel, Merle d'Aubigné (PMA) score and the Harris score, directly calculated using the application digital “CJ Ortho” [8] from the College of Young Orthopedists (of France) available on Google Play

This objective evaluation was completed and superimposed on the personal subjective level of satisfaction that the patient gave with the clinical and functional result of his operation. The collection of data was gradual, but their compilation was made during the period from November 4 to December 29, 2019.

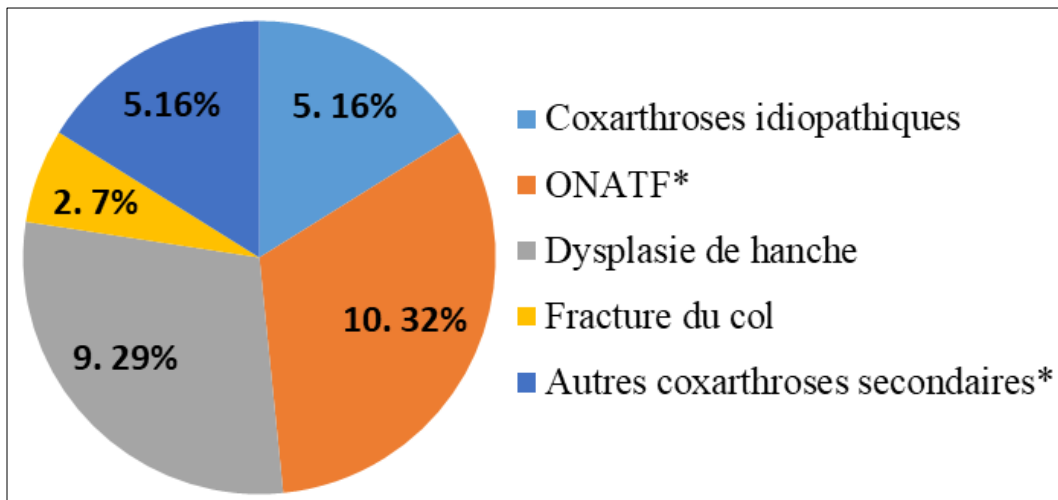
Data were entered and analyzed using Epi Data version 3.1, Microsoft Excel 2013, EPI INFO version 7.2.2.6 (CDC Atlanta) software. The Chi2 test was used to compare proportions with a significance threshold of  $p \leq 0.05$ .

**3. Results**

Duration of hospital stay and oral relay time  
 The average hospital stay of 7.16 days (extremes 4 and 16),  
 21

**3.1 Operative indications**

The 31 hips operated on were for formal indications (Fig.3).



ONATF\*: Aseptic osteonecrosis of the femoral head.  
 Other secondary coxarthrosis\*: sequelae of traumatic lesions.

**Fig 3:** Distribution of patients according to the indications for hip prostheses.

**3.2 Radiological results**

Cup size and inclination angle (AIC) The cups were of adjusted size and at the equator of the native acetabulum in

29 (93.55%) of cases, and large in the other cases (2). The average AIC was 44.51° (extremes 17° and 62°).



**Fig 4:** Frontal x-ray of the pelvis with horizontalized cup, AIC: 17°.



**Fig.5:** Frontal x-ray of the pelvis with vertical cup, AIC: 62°.

We looked for a relationship between the approach used and cup inclination defects; we did not find a significant

relationship, p=0.6001 (Table VIII).

**Table 9:** Search for a relationship between the approach and the AIC

AIC*	Horizontalized	Normal	Verticalized	Total
VA	4	10	1	15
VAL	4	9	3	16
TOTAL	8	19	4	31

p=0,6001. AIC\* : angle of inclination of the cup.

**Measurement of prosthetic femoral offset:** Comparative measurements of femoral offset were only appropriate in 21 prosthetic hips. It was greater than or equal to the native femoral offset in 13 patients (61.9%), and lower in 08 (38.1%). And if we take as a desirable threshold a femoral

offset reduced by at most 10% [26], the offset could be considered satisfactory in 16 patients (76.2%). The 05 cases (23.8%) of reduced offsets were by an average of 8.6mm (extremes 5.3 and 12.1).

### 3.3 Functional results

Postoperative lower limb length measurements

The postoperative measurement of the length of the lower limbs (Table IX) made it possible to note 12 cases of length inequality.

**Table 10:** Results of postoperative limb length measurements

	n	%
<b>Isometry</b>	19	61.29
ILMI postoperative	12	38.71
• <b>Lengthening (iatrogenic)</b>	05	16.13
• <b>Lengthened but still short</b>	07	22.58
Egalization of preoperative ILMI length	07/14	50
Well tolerated postoperative (0.5 -1cm)	07/12	58.33
Wearing a length compensating heel pad	05/12	41.67
• For iatrogenic lengthning	02/05	40
• To compensate for the residual deficit	03/07	42.85

#### PMA score on postoperative

The mean value of the PMA score increased from 9.16 points preoperatively to 16.1 points postoperatively, i.e. relatively from a poor to good score.

(Paintings).

**Table 11:** Comparison of the PMA\* rating before and after surgery

	Pre-operative		Post-operative	
	n	%	n	%
Excellent	0	0	9	29.03
Very good	0	0	6	19.36
Good	0	0	7	22.58
Fair	3	9.68	7	22.58
Poor	13	41.93	2	6.45
Bad	15	48.39	0	0
Total	31	100	31	100

PMA\* : Postel Merle d'Aubigné.

Harris functional score and subjective satisfaction level on postoperative day 45.

The mean value of the Harris score increased from 47.96 points preoperatively to 86.1 points postoperatively, i.e. relatively from a poor to good score. And this score was perfectly superimposable to the subjective satisfaction level of patients with a p = 0.0001 (Table XI)

**Table 12:** Correlation between the Harris score and the subjective level of satisfaction

Harris rating	Subjective level of satisfaction				Totals	
	Excellent	Good	Fair	Bad	n	%
Excellent	15	2	0	0	17	54.84
Good	3	3	0	0	6	19.35
Good enough	0	5	0	0	5	16.13
Bad	0	2	1	0	3	9.68
Totaux	n	18	12	1	0	31
	%	58.06	38.71	3.23	0	

Ki2 =28,9255. P=0,0001

## 4. Discussion

### 4.1 Age and indications

With an average age of 45.67 years (22 - 85), our results are close to the African series of Kombate<sup>[9]</sup> and Kassimi<sup>[10]</sup> and

are in contrast with the Western series of Müller<sup>[11]</sup> and Batailler<sup>[12]</sup> ( Table XII).

**Table 13:** Comparison of average ages and surgical indications

%	Kombate <sup>[9]</sup>	Kassimi <sup>[10]</sup>	Müller <sup>[11]</sup>	Batailler <sup>[12]</sup>	Our serie
Year	2014	2014	2014	2016	<b>2019</b>
Sample	58	93	150	201	<b>31</b>
Middle age	42,69	47,23	64	72	<b>45,67</b>
Coxarthrosis I	20,65	14	86	82,6	<b>23</b>
Coxarthrosis II	79,35	86	14	17,4	<b>77</b>

The reason for this contrast is found in the therapeutic indications which, in our African series, are dominated by secondary coxarthrosis in line with the young age of our patients, because they are more quickly destructive and semiologically earlier. This, unlike Western series which are dominated by primary hip osteoarthritis, also in line with the older age of their patients<sup>[13]</sup>.

These young people deserve to be taken care of in order to give them the chance to achieve or regain autonomy.

### 4.2 Functional results

The need to give the patient a pain-free and mobile hip in order to improve their quality of life is the goal of THA implantation. This requires that a reliable assessment of its functional result must be based not only on the surgeon's assessment, but also on the patient's subjective assessment. Thus, most publications always use at least one objective

functional assessment score (PMA and Harris scores) and a subjective self-assessment score completed by the patient himself<sup>[9]</sup>.

The language barrier<sup>[2]</sup> did not allow us to use a classic self-assessment score (WOMAC Score). Following Witvoet's suggestions, we replaced it with the level of subjective satisfaction that the patient himself can freely express<sup>[2]</sup>.

Given our initial postulate according to which an evaluation at the 45th day would be more relevant to evaluate the benefit of one series compared to another and that the establishment of a statistically significant correlation between objective and subjective results would be one more argument, we were interested in the rate of patients with a result above the "fair" level (Table XIV).

Our functional results are generally satisfactory and can be applied both postoperatively and preoperatively, so they are reliable.

**Table 13:** Selective compilation of Postel Merle d'Aubigné (PMA), Harris and subjective satisfaction level (NSS) ratings on

	(%)
PMA rating preoperative « bad » or « poor »	90.32
PMA rating postoperative de « good » to « excellent »	71
Harris rating preoperative « bad »	93.55
Harris rating « excellent »	54.84
NSS « excellent »	5.06
Harris rating « good » or excellent	74.19
NSS « good » and more	96.77

### 4.3 Radiological results

The strong points of our radiological evaluation are summarized in (Table XV), our average cup inclination angle (AIC) is comparable to those in the literature.

### FT

Regarding the AIC, the reference used by most authors is the Lewinneck safe zone [14, 15]. But Seagrave *et al.* In a systematic review of the literature [16] the authors concluded that there is no significant difference between the rate of dislocation occurring on cups positioned in the safe zone and those which are not, and that consequently the concept of the Lewinneck safe zone would no longer be justified. Likewise, Banaszkiwicz [17], questions the notion of a safe zone and instead insists on taking into account the combined

anteversion of the cervix and the cup, muscular tension, the approach, the size of the head, the type of insert. And other authors have shown that for the inclination of the cup, the orientation of the transverse ligament would be a more reliable benchmark, specific to the anatomy of each patient [18].

We did not find a significant correlation between the positioning of the cup and the approach or installation used. But Takada R *et al.* [19], concludes that the DD installation allows better precision in the inclination of the cup than the DL.

Comparative measurement of femoral offset was only possible in 21 patients with an acceptable restoration rate of 76.2%. Restoration of the femoral offset is a desirable objective for the longevity and stability of the prosthesis, as well as for the quality of walking through the action of the abductors and therefore for customer satisfaction [20].

This is why several increasingly precise intraoperative planning and control technologies have been developed for this purpose. Radiographic planning in 2 dimensions, although the least precise, still remains our only asset for this purpose, we must give ourselves the best possibilities. found in the studies of Müller [11], Lee [21], Den Hartog [22], Batailler [12] and Aggarwal [23] (Table XIII).

**Table 14:** Comparison of the incidence of surgical complications

%	Müller [11]	Lee [21]	Den Hartog [22]	Batailler [12]	Aggarwal [23]	Our serie
Year	2014	2015	2015	2016	2019	2019
Sample	150	11810	450	201	147	31
Fracture du GT*	1,3	2,3**	2,9	2,5	1,65**	13,3
Femoral fracture	0,7		1,3	0,5		3,23
Acetabulum fracture	1,3	0	0	0	0	3,23
Lesions NCLC*	0	2,11	4,0	0	0	13,3
Luxation	2,7	1,2	2,9	0	1,28	3,23

\*NCLC: lateral cutaneous nerve of the thigh. GT: Greater trochanter. \*\*Combined result.

The high complication rate in our series is explained by the incomparably small size of our sample (n=31). And the occurrence of periprosthetic fractures (19.76%) was probably favored by retractions of the gluteal muscles, particularly on dysplastic hips.

### 5. Conclusion

Total hip arthroplasty is a common, well-controlled procedure. But its practice is still insufficient in low-income countries, because of its still difficult accessibility for a large majority of populations.

In this context, the organization of fairground hip arthroplasty is a godsend for many, although the implants must be of good quality and the practitioners well-versed.

These three editions of fairground surgery present in their vast majority all the technical and technological indicators of a successful operation with a good prognosis and have enabled the return to more than acceptable physical activity for all beneficiaries.

The low hemorrhagic nature of the minimally invasive anterior and anterolateral approaches makes them an asset to acquire for our countries frequently exposed to shortages of blood to transfuse.

### 6. Conflict of Interest

Not available

### 7. Financial Support

Not available

### 8. References

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