

Intermediate Hip Arthroplasty in Gabon: Blood Loss and Risk Factor for Transfusion

Ghislain Edjo Nkilly^{1*} , Pascal Christian Nze Obiang² , Raphael Okoue Ondo¹ ,
Arthur Matsanga³, Stéphane Oliveira⁴, Léandre Nguiabanda⁵,
Jean-Marcel Mandji-Lawson⁴

¹Department of Anaesthesia and Intensive Care, Omar Bongo Ondimba Army Training Hospital (HIAOBO), Libreville, Gabon

²Department of Anaesthesia and Intensive Care, Jeanne Ebori Fondation, Libreville, Gabon

³Department of Anaesthesia and Intensive Care, Owendo University Hospital (CHUO), Libreville, Gabon

⁴Department of Anaesthesia and Intensive Care, Akanda Army Training Hospital, Libreville, Gabon

⁵Orthopedic Surgery Service, Omar Bongo Ondimba Army Training Hospital (HIAOBO), Libreville, Gabon

Email: *edjonkillyghislain@yahoo.fr, nze_pascal@yahoo.fr, raphaelokoue@gmail.com, matsangaarthur@yahoo.fr, steph_oliveira@yahoo.fr, Inguiabanda@yahoo.fr, mandji_lawson@yahoo.fr

How to cite this paper: Nkilly, G.E., Obiang, P.C.N., Ondo, R.O., Matsanga, A., Oliveira, S., Nguiabanda, L. and Mandji-Lawson, J.-M. (2024) Intermediate Hip Arthroplasty in Gabon: Blood Loss and Risk Factor for Transfusion. *Open Journal of Anesthesiology*, **14**, 109-117.

<https://doi.org/10.4236/ojanes.2024.144008>

Received: January 6, 2024

Accepted: April 6, 2024

Published: April 9, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc.

This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Background: Hip arthroplasty is a surgery with a high risk of bleeding. The main objective of this study was to research risk factors for bleeding and transfusion in patients undergoing hip hemiarthroplasty in Gabon. **Method:** It was a retrospective, monocentric, descriptive and analytical study carried out from June 2011 to June 2021 at the Omar Bongo Ondimba army training hospital. The variables studied were demographic characteristics, biological variables, transfusion and intraoperative data. The primary outcome was intraoperative transfusion. A univariate and multivariate analysis was conducted to identify the factors associated with the occurrence of a transfusion. **Results:** Of the 97 patients included, the average age was 74.2 years \pm 10, male predominance was 73.2%, the average ASA score was 1.9 \pm 0.5, and transfusion incidence was 38.1%. The average number of RBCs transfused was 1.2 \pm 0.6. Tranexamic acid was used in 11.3% of patients. The average bleeding was 450 \pm 453 ml. Preoperative anemia was predictor of transfusion to be significant. **Conclusion:** The incidence of transfusion is low compared to total hip arthroplasty. The implementation of a patient blood management protocol is difficult given the urgency of bone repair. However, a better use of tranexamic acid could reduce this transfusion incidence.

Keywords

Hip Arthroplasty, Risk Factors, Patients, Hemiarthroplasty, Gabon

1. Introduction

The intermediate hip prosthesis or hip hemiarthroplasty is used for certain fractures of the upper end of the femur. This surgery is often carried out urgently. It concerns an elderly, fragile, polypathological population. The objective of early surgical treatment (48 to 72 hours) is to reduce morbidity and mortality and allow early rehabilitation. The surgery can be performed under general or regional anesthesia. This is the best option when the acetabulum is healthy and the head of the femur is doomed to necrosis. The surgical procedure is less complex than a total prosthesis and allows patients to walk again quickly. The operation is less cumbersome than the installation of a total hip prosthesis and it lasts less time and bleeds less [1]. The main disadvantage of the intermediate hip prosthesis is the reduction in mobility after surgery. Compared to total hip replacement, long-term results are better for total hip replacement, particularly the risk of dislocation [2] [3]. Hip prosthetic surgery has been available in Gabon since 2012, mainly at the Omar Bongo Ondimba army training hospital, at Libreville [4].

Blood transfusion remains a concern during surgery for intermediate hip replacement, although this technique has a lower risk of bleeding than total hip replacement, and the use of transfusion is often necessary.

The objective of the study was to describe the transfusion practice during anesthesia for hip hemiarthroplasty in Gabon.

2. Material and Method

The study received approval from the ethics committee of the Omar Bongo Ondimba Army Training Hospital, Gabon.

- Study design

This is a retrospective, descriptive and analytical study. The study was performed in the anesthesia resuscitation department of Omar Bongo Ondimba Army Training Hospital over 11 years, from January 2011 to June 2021.

- Participant

*Inclusion criteria: Patients who underwent intermediate hip prosthesis (IHP) were included.

*Non-inclusion criteria: Patients who underwent DHS (dynamic hip screw), total hip arthroplasty or Clous Gamma were not included.

*Given the retrospective nature of the study, we did not calculate the sample size.

- Study variables

The variables studied were sociodemographic (age, sex, weight, height, BMI, history), comorbidities (arterial hypertension, diabetes, renal failure, HIV, sickle cell disease), ASA score, Biologicals (NFS, urea, creatinine, blood ionogram, coagulation assessment, GsRh, RAI, bilirubin, troponin), operating variables (anesthesia, tranexamic acid, operating time, blood loss), per and post complications operations, per and post-operative blood transfusion.

The variables studied were obtained from medical records (sociodemographic variables, comorbidities), surgical records (postoperative clinical and biological data) and anesthetic records (technical and operative data). All these variables were listed on a survey sheet separated into 3 periods (pre, per and post operative). After discharge from hospital, patients were seen by the surgeon on day 14, day 21 and day 30 as part of the follow-up to obtain late data. All the operated patients carried out an infectious assessment in search of a urinary, dental, sinus infection and antibiotic prophylaxis during the surgery. A cardiological evaluation by electrocardiogram and echocardiography was performed in all patients.

- Bias

There is a risk of recruitment bias. The surgery was performed by two surgeons with different medical experience but they used the same surgical technique.

- Quantitative variables

The quantitative variables were presented according to their means and standard deviations. The qualitative variables were presented according to their respective numbers and percentages.

- Statistical analysis

Data were entered on computer and analyzed using Epi Info 7.2 software, IBM SPSS version 21 and Excel 2016. For data comparison, we used the Chi² test, the Pearson test and the significance level < 5%. The quantitative descriptive variables were expressed on average with the standard deviation. Qualitative variables were described as percentages. Nonparametric Kruskal Wallis tests for independent samples were used to compare quantitative variables by linear regressions. This made it possible to link together different quantitative variables with determination of the Pearson correlation coefficient. The difference was significant for p values less than 0.05.

3. Results

During the study period, 97 patients benefited from an intermediate hip prosthesis.

- Demography

The surgery concerned elderly patients, mainly males with co-morbidities particularly High blood pressure, with a low ASA score (**Table 1**).

- Perioperative data

The operating time was relatively high. The mean hemoglobin level was 11.9 ± 1.9 g/dl with a minimum of 5.7 and a maximum of 18.6. Blood losses were around 450 ml. **Table 2** summarizes the intraoperative data.

- Transfusion aspects

Transfusion was performed in 37 patients (38.1%). The average number of RBCs transfused was 1.2 ± 0.6 with a maximum of 3 per patient and an average blood loss of 450 ± 453 ml and a maximum of 1900 ml. Tranexamic acid (exacyl[®]) was used in 11 (11.3%) patients (**Table 3**).

- Univariate analysis

It shows a significant difference in age, values hemoglobin, hematocrit and

Table 1. Demographics.

	demographics
Age (years)	
Mean \pm SD	74.2 \pm 10
Sex	
Male	71 (73.2%)
Female	26 (26.8%)
Comorbidities	
High blood pressure	54 (55.7%)
Diabetes	18 (18.6%)
Obesity	05 (5.2%)
HIV	1 (1%)
ASA score (Mean)	1.9 \pm 0.5
ASA 1	18 (18.6%)
ASA 2	69 (71.2%)
ASA3	10 (10.3%)
preoperative biology (Mean)	
Hemoglobin (g/dl)	11.5 \pm 2
Hematocrit (%)	35.3 \pm 5.8
Platelet count (/mm ³)	234.6 \pm 96.2
Urea (mmol/l)	5.3 \pm 3.8
Creatinine (μ mol/l)	96 \pm 115
Blood sugar (mmol/l)	6 \pm 1.6

Table 2. Intraoperative data.

	Intraoperative data
Operating time (hour)	
Mean	3.3 \pm 8
Prosthesis	
Hemiarthroplasty	97 (100%)
Mean Intraoperative blood loss(ml)	450 \pm 453

Table 3. Transfusion data.

Transfused patients	Number	%
Total	37	38.1
Tranexamic acid	Number	%
Tranexamic acid +	11	11.3
Tranexamic acid –	86	88.7
Blood loss (ml)	450 \pm 453	
transfusion complications (numbers)	0	0

ASA score (**Table 4**)

- Multivariate analysis

After multivariate analysis with logistic regression, only hemoglobin remained

Table 4. Analysis of transfused and non-transfused populations.

	Transfused	Not transfused	p
Duration of surgery (hours)	3.2 ± 0.9	3.3 ± 0.7	0.420
Hemoglobin (g/dl)	10.6 ± 1.8	12.0 ± 2	0.001
Hematocrit (%)	33.3 ± 5.5	36.7 ± 5.7	0.009
Age (years)	74.1 ± 12.5	74.2 ± 9.3	0.966
ASA score	1.8 ± 0.6	2 ± 0.5	0.048
Creatinine (µmol/l)	108.9 ± 164	88.8 ± 70.5	0.435
Blood loss (ml)	675 ± 613	337.5 ± 324.8	0.141
Left ventricular ejection fraction (%)	68.3 ± 7.8	69.5 ± 8.7	0.540

Table 5. Risk factors associated with transfusion by logistic regression.

	OR[95 CI %]	p
Hemoglobin	0.66 [0.49 - 0.89]	0.006
Blood loss	0.77 [0.26 - 2.28]	0.640
diabetes	0.56 [0.58 - 1.74]	0.391
Complications	1.09 [0.17 - 6.82]	0.930
Male gender	0.5 [0.19 - 1.35]	0.169
Obesity	0.39 [0.04 - 3.62]	0.391

significantly related to transfusion. An increase of one unit in the hemoglobin level reduced the risk of transfusion by a factor of 34%. All other factors were unrelated to transfusion (**Table 5**).

4. Discussion

The aim of this study was to investigate the factors affecting operative hemoglobin loss and the frequency of transfusions in patients undergoing intermediate hip arthroplasty.

- **Epidémiology**

Study carried out on a homogeneous population composed of patients having benefited from intermediate hip prosthesis (IHP). IHP is performed for fracture of the femoral neck, a pathology most often affecting elderly male subjects in our study but in other studies, there is a female predominance explained by osteoporosis. In our study and elsewhere the population has a high age around 70 - 80 years old with comorbidities.

- **Transfusion**

The incidence of transfusion is low in our study population (38.1%), with modest blood loss.

Indeed, the low incidence of transfusion is linked to the surgical technique which is less aggressive and less hemorrhagic than total hip arthroplasty. Aris Luangwaranyoo *et al.* [5] found a transfusion incidence of 39% in a cohort of

323 hip hemiprosthesis for fracture of the femoral head. Liidakis *et al.* [6] found an increase in the number of transfusions in the total hip arthroplasty group in a study comparing total hip arthroplasty and hemiarthroplasty, in this study, transfusion concerned 7.04% of patients who received hemiarthroplasty, moreover, postoperative mortality was correlated with transfusion, the study included 4058 patients and 3192 hip hemiarthroplasty. The study of Corentin Pangaud *et al.* [2] which compared total prostheses and intermediate prosthesis found a transfusion rate of the intermediate prosthesis group at 7.03% on a sample of 64,106 patients.

In our study, the main risk factor for transfusion was the existence of preoperative anemia. Blood loss, obesity, male gender and ASA score were not risk factors for transfusion (Table 5). The study by Aris Luangwaranyoo *et al.* [5] found as a risk factor for transfusion a female gender (odds ratio (OR) 2.00, $p = 0.037$), a body mass index lower than 18.5 kg/m² (OR 2.40, $p = 0.028$), lower preoperative hemoglobin levels (OR 0.52, $p < 0.001$) and general anesthesia (OR 2.07, $p = 0.028$). The weakness of our sample may explain this difference, the study by Luangwaranyoo *et al.* included 323 patients with 232 women while our study included 71 women in a sample of 97 people (Table 1).

Preoperative anemia is common in orthopedic arthroplasty surgery and is prevalent in approximately 25% of patients [7] [8]. Low preoperative Hemoglobin has been identified as an independent risk factor for postoperative transfusions after hip or knee arthroplasty [9] [10]. This anemia may be associated with high morbidity and mortality and a high incidence of red blood cell transfusions [7]. Our study finds a preoperative hemoglobin level of 11.5 g/dl, despite this anemia was not accompanied by an increase in the incidence of transfusion and blood loss is low in our study (450 ml \pm 453). Vipin Sharma *et al.* [11], comparing intraoperative bleeding between total and hemiarthroplasty found a reduction in bleeding in favor of the hemiarthroplasty group (200 ml versus 300 ml). Blomfeldt *et al.* [12] has also found a reduction in bleeding in the hemiarthroplasty group (460 ml (100 to 1100) versus 320 ml (50 to 850) ($p < 0.001$)), thus the reduction in intraoperative bleeding also explains the low transfusion rate despite preoperative hemoglobin moderate.

Tranexamic acid has been used very little in our practice (11 patients) mainly for reasons of availability. Its impact on intraoperative bleeding was not evaluated in our study. Since a long time Tranexamic acid has been proved to be effective in preventing blood transfusions as well as reducing perioperative blood loss. Meta-analysis of Sadigursky *et al.* [13] in 7 randomized clinical trials, 948 patients and Rajiv Gandhi *et al.* [14], in 33 clinical trials, 403 patients reported a reduced blood loss and lower transfusion rates for patients receiving tranexamic acid, without an increased risk for deep vein thrombosis, pulmonary embolism or other complications in total hip arthroplasty, this effectiveness of tranexamic acid was confirmed by Rapeepat Narkbunnam *et al.* [15] and Simone Augustinus *et al.* [16] in two studies on intermediate hip prosthesis in the context of frac-

tures of the femoral head, without an increase in thromboembolic risk. The meta-analysis by Leverett *et al.* [17] confirms the low thromboembolic risk associated with tranexamic acid during hip hemiarthroplasty.

However, some outcomes indicate that the avoidance of suction drains might be as important as the use of tranexamic acid for the reduction of perioperative blood loss.

Unlike total hip arthroplasty, it is difficult to set up a hemoglobin optimization program with treatment of iron deficiency, erythropoietin during intermediate hip arthroplasty, it would take a lot of time, the priority here is the repair of the fracture of the femoral neck, the use of transfusion helps optimize the hemoglobin level.

5. Study Limitations

1) The present study has several limitations, mainly due to its retrospective design. Secondly, patients have been operated by different surgeons, which might have influenced bleeding. Thirdly, the criteria for insertion of suction drains were systematic, thus, surgeons' expertise and patient risk factors may have influenced the decision on the use of suction drains.

2) Not taking into account blood loss through the drains. The insertion of drains after knee or hip arthroplasty is still a matter of controversy [18] [19]. The insertion of a suction drain has no proven benefits. Using enhanced recovery protocols in the arthroplasty leads to a changing role for drains, particularly with the use of tranexamic acid. Most literature is from the pre-tranexamic era and there are only few studies on the use of drains in combination with tranexamic acid. In our study, this aspect was not taken into account although in our practice, the installation of drains is very frequent and depends on the surgeons.

6. Conclusion

Preoperative anemia is the main risk factor for transfusion during intermediate hip arthroplasty. A patient blood management type program, although having shown its effectiveness, is difficult to implement in this context given the urgency linked to bone repair. Better use of tranexamic acid associated with minimally invasive surgery could reduce the incidence of transfusion, improve postoperative rehabilitation, save resources, reduce costs and improve patient safety.

Authors' Contributions

- G. Edjo Nkilly: principal investigator, drafting the manuscript.
- R. Okoue Ondo: inclusion and follow-up of patients.
- A. Matsanga: inclusion and follow-up of patients.
- PC Nze Obiang: inclusion and follow-up of patients.
- S. Oliveira: inclusion and follow-up of patients.
- L. Nguiabanda: surgeon, inclusion and follow-up of patients.
- JM Mandji-Lawson: reading and final approval of the manuscript.

Agreement

a) All authors of the manuscript have read and agreed to its content and are accountable for all aspects of the accuracy and integrity of the manuscript;

b) This submitted article is an original work that is not being considered or reviewed by any other publication and has not been published elsewhere in the same or a similar form.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Li, X.B. and Luo, J.N. (2021) Hemiarthroplasty Compared to Total Hip Arthroplasty for the Treatment of Femoral Neck Fractures: A Systematic Review and Meta-Analysis. *Journal of Orthopaedic Surgery and Research*, **16**, Article Number: 172. <https://doi.org/10.1186/s13018-020-02186-4>
- [2] Pangaud, C., Pioger, C., Pauly, V., Orleans, V., Boyer, L., Jean-Noël Argenson, D. and Matthieu Ollivier, D. (2023) Les prothèses totales de hanche permettent de réduire le risque de luxation après fracture du col fémoral. *Revue de Chirurgie Orthopédique et Traumatologique*, **109**, 562-567. <https://doi.org/10.1016/j.rcot.2023.02.002>
- [3] Morgan, S., Jarvis, S., Conti, A., Staudinger, K., Reynolds, C. and Bar-Or, D. (2023) Displaced Geriatric Femoral Neck Fractures: A Retrospective Comparison of Total Hip Arthroplasties versus Hemiarthroplasty. *Geriatric Orthopaedic Surgery & Rehabilitation*, **14**, 21514593231198949. <https://doi.org/10.1177/21514593231198949>
- [4] Nkilly, G.E., Ondo, R.O., Matsanga, A., Obiang, P.C.N., Oliveira, S., Nguiabanda, L., Mandji-Lawson, J.-M. and Tchoua, R. (2023) Frequency of Transfusions and Risk Factor for Bleeding Risk to Guide a Blood-Sparing Program during Hip Arthroplasty in Gabon. *Open Journal of Anesthesiology*, **13**, 47-57. <https://doi.org/10.4236/ojanes.2023.133005>
- [5] Luangwaranyoo, A., Suksintharanon, M., Tangadulrat, P., Iamthanaporn, K., Hongnaparak, T. and Yuenyongviwat, V. (2020) Factors for Blood Transfusions Following Hemi Hip Arthroplasty for Patients with Femoral Neck Fracture. *Geriatric Orthopaedic Surgery & Rehabilitation*, **11**, 2151459320972993. <https://doi.org/10.1177/2151459320972993>
- [6] Liodakis, E., Antoniou, J., Zukor, D.J., Huk, O.L., Epure, L.M. and Bergeron, S.G. (2016) Major Complications and Transfusion Rates after Hemiarthroplasty and Total Hip Arthroplasty for Femoral Neck Fractures. *The Journal of Arthroplasty*, **31**, 2008-2012. <https://doi.org/10.1016/j.arth.2016.02.019>
- [7] Fowler, A.J., *et al.* (2015) Meta-Analysis of the Association between Preoperative Anaemia and Mortality after Surgery. *British Journal of Surgery*, **102**, 1314-1324. <https://doi.org/10.1002/bjs.9861>
- [8] Jans, Ø., Jørgensen, C., Kehlet, H. and Johansson, P.I. (2014) Role of Preoperative Anemia for Risk of Transfusion and Postoperative Morbidity in Fast-Track Hip and Knee Arthroplasty. *Transfusion*, **54**, 717-726. <https://doi.org/10.1111/trf.12332>
- [9] Noticewala, M.S., Nyce, J.D., Wang, W., Geller, J.A. and Macaulay, W. (2012) Pre-

- dicting Need for Allogeneic Transfusion after Total Knee Arthroplasty. *The Journal of Arthroplasty*, **27**, 961-967. <https://doi.org/10.1016/j.arth.2011.10.008>
- [10] Ogbemudia, A.E., Yee, S.Y., MacPherson, G.J., Manson, L.M. and Breusch, S.J. (2013) Preoperative Predictors for Allogenic Blood Transfusion in Hip and Knee Arthroplasty for Rheumatoid Arthritis. *Archives of Orthopaedic and Trauma Surgery*, **133**, 1315-1320. <https://doi.org/10.1007/s00402-013-1784-8>
- [11] Sharma, V., Awasthi, B., Kumar, K., Kolhi, N. And Katoch, P. (2016) Outcome Analysis of Hemiarthroplasty vs. Total Hip Replacement in Displaced Femoral Neck Fractures in the Elderly. *Journal of Clinical and Diagnostic Research*, **10**, 11-13. <https://doi.org/10.7860/JCDR/2016/18638.7877>
- [12] Blomfeldt, R., Törnkvist, H., Eriksson, K., Söderqvist, A., Ponzer, S. and Tidermark J. (2007) A Randomised Controlled Trial Comparing Bipolar Hemiarthroplasty with Total Hip Replacement for Displaced Intracapsular Fractures of the Femoral Neck in Elderly Patients. *The Journal of Bone and Joint Surgery*, **89**, 160-165. <https://doi.org/10.1302/0301-620X.89B2.18576>
- [13] Sadigursky, D., Arujo, L.M. and Fernandes, R.J.C. (2018) Efficacy of Tranexamic Acid in Reducing Blood Loss in Total Knee Arthroplasty. *Acta Ortopédica Brasileira*, **26**, 63-66. <https://doi.org/10.1590/1413-785220182601149210>
- [14] Gandhi, R., Evans, H.M.K., Mahomed, S.R. and Mahomed, N.N. (2013) Tranexamic Acid and the Reduction of Blood Loss in Total Knee and Hip Arthroplasty: A Meta-Analysis. *BMC Research Notes*, **6**, Article Number: 184. <https://doi.org/10.1186/1756-0500-6-184>
- [15] Narkbunnam, R., Chompoonutprapa, A., Ruangsomboon, P., Udomkiat, P., Charancholvanich, K. and Pornrattanamaneewong, C. (2021) Blood Loss and Transfusion Rate Compared among Different Dosing Regimens of Tranexamic Acid Administration in Patients Undergoing Hip Hemiarthroplasty for Femoral Neck Fracture: A Randomized Controlled Trial. *Injury*, **52**, 2986-2990. <https://doi.org/10.1016/j.injury.2021.08.001>
- [16] Augustinus, S., Mulders, M.A.M., Gardenbroek, T.J. and Goslings, J.C. (2023) Tranexamic Acid in Hip Hemiarthroplasty Surgery: A Systematic Review and Meta-Analysis. *European Journal of Trauma and Emergency Surgery*, **49**, 1247-1258. <https://doi.org/10.1007/s00068-022-02180-x>
- [17] Leverett, G.D. and Marriott, A. (2023) Intravenous Tranexamic Acid and Thromboembolic Events in Hip Fracture Surgery: A Systematic Review and Meta-Analysis. *Orthopaedics & Traumatology: Surgery & Research*, **109**, Article ID: 103337. <https://doi.org/10.1016/j.otsr.2022.103337>
- [18] Maniar, R.N., et al. (2019) Role of Suction Drain after Knee Arthroplasty in the Tranexamic Acid Era: A Randomized Controlled Study. *Clinics in Orthopedic Surgery*, **11**, 73-81. <https://doi.org/10.4055/cios.2019.11.1.73>
- [19] Sharma, G.M., Palekar, G. and Tanna, D.D. (2016) Use of Closed Suction Drain after Primary Total Knee Arthroplasty-an Overrated Practice. *SICOT-J*, **2**, 39. <https://doi.org/10.1051/sicotj/2016034>