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Original Research Article

What Drug-based Blood-sparing Strategy for Total Hip Replacement (THR) Surgery at the University Hospital Center (CHU) de la Renaissance in Chad?

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Abstract: Total hip replacement (THR) surgery is an operation with a high bleeding potential. It is performed regularly at the University Hospital Center (CHU) of N'Djamena. To overcome the difficulties of blood supply and minimize the infectious risks that can result from blood transfusion. We paid particular attention to carrying out a prospective epidemiological study of the blood-sparing strategy, using drugs such as tranexamic acid (ATX) and iron. We enrolled 44 patients during our 13-month study period from November 1, 2022 to December 31, 2023. 47.73% (n=21) of patients received a dose of 1g of ATX in 30 min before incision and 500mg at the end of the procedure, 25% (n=11) received a dose of 500mg before incision and 500mg/6h/24h and 11.36% received 1g only at incision. Blood loss was greater in the non-ATX group, with P-value above the confidence level (0.32 > 0.05). Thus, through this study and the various studies carried out on the subject [4, 6-10], we were able to observe that the use of the combination of tranexamic acid and iron proves effective for the blood-sparing strategy during THP surgery.

Keywords: Transfusion sparing - Tranexamic acid -Iron- PTH surgery.

1. INTRODUCTION

Total hip replacement (THR) surgery is one of a number of orthopedic procedures involving significant blood loss, often requiring homologous blood transfusion [1]. While homologous blood transfusion is not a risk-free therapy, it also has its limitations in terms of blood product supply.

The Centre Hospitalier Universitaire la Renaissance in N'Djamena is one of the hospitals in Chad currently performing this surgery. Intraoperative blood loss complicated by postoperative anemia is a frequent occurrence. This observation prompted us to carry out a descriptive epidemiological study in order to implement a blood-sparing strategy.

2. PATIENTS AND METHODS

We conducted a prospective descriptive epidemiological study at the Centre Hospitalier Universitaire la Renaissance for total hip replacement (THR) surgery, and eligible for the blood-sparing strategy during a thirteen (13) month period from November 1, 2022 to December 31, 2023. Its aim was to determine homologous transfusion sparing strategies during this surgery. The work focused largely on describing the facts in order to better understand the best blood-sparing strategy in our context. Our sample included all patients who underwent total hip replacement surgery at CHU la Renaissance during the period of our investigation. All patients operated on for hip arthroplasty other than THR, and all patients who had not given their consent to be included in our study, were excluded.

The dependent variables in our study are anthropomorphic characteristics such as age, sex and weight; but also clinical data such as hemoglobin level, preoperative hematocrit, PT and APTT as well as comorbidities. We use the same operators and the same technique, the approach is lateral, the bipolar is a scalpel used for electrocoagulation, and all patients are installed

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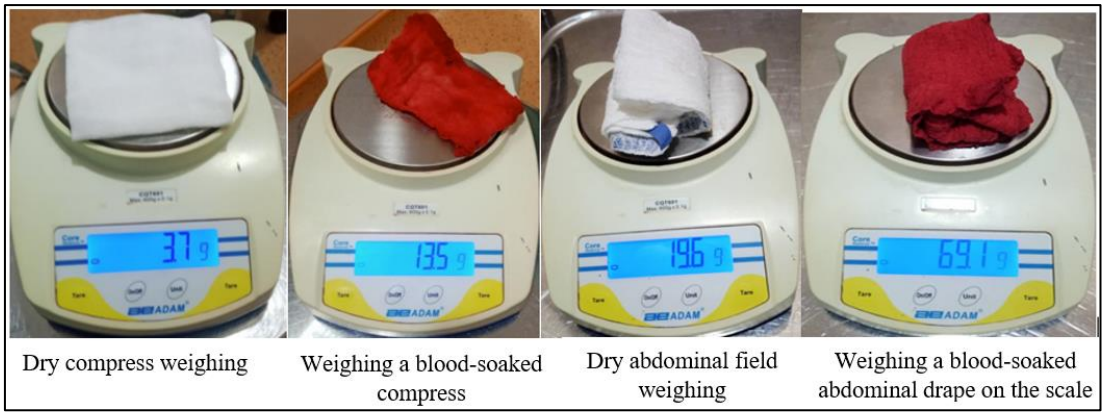
in lateral decubitus position. Thromboprophylaxis is identical postoperatively.

Evaluation of perioperative blood loss (jar, surgical field and drains), which consists in measuring actual blood loss during and after surgery, i.e. the sum of the amount of blood loss collected in the aspiration jar, plus the count of previously weighed compresses.



We weighed the dry and blood-soaked compresses and the dry and blood-soaked abdominal drape. A dry 10cm x 10cm woven compress blade weighed 3.7g, and a blood-soaked blade weighed 13.5g. A slide of dry abdominal compresses (abdominal drapes) weighs 19.6g, and once soaked in blood, it weighs 69.1g.

Quantifying the bleeding collected in surgical abdominal swabs and drapes involves subtracting the weights of dry abdominal swabs and drapes from the weights of blood-soaked abdominal swabs and drapes in grams, corresponding to one milliliter of blood in the abdominal swabs and drapes, where 1 gram equals 1 milliliter of blood loss.

Transfusion-sparing methods linked to anaesthesia techniques: the two techniques used are general anaesthesia and spinal anaesthesia; controlled hypotension induced by the use of propofol has been demonstrated. Transfusion-sparing techniques such as TAP (programmed autologous transfusion), HDNVI (intentional normovolemic hemodilution) and blood recovery and retransfusion were not used in our study.

In the literature, transfusion-sparing strategies linked to the use of drugs include iron, EPO, Aprotinin and Tranexamic acid. Tranexamic acid (ATX) and oral iron were the only molecules used in our study. ATX was administered intravenously (IV) at a dose of 15-20 mg/kg, or 1g for an adult, at least 30 min before incision; sometimes it was administered postoperatively, depending on the presence of haemorrhage, or if haemostasis disorders were observed intraoperatively or postoperatively. For iron, a dose of 100mg twice daily was prescribed. We then used the following software: SPSS was used as a data entry and analysis mask, and Microsoft Excel (2016) was used to process tables and graphs.

3. RESULTS OF OUR STUDY

We collected 44 out of 105 patients who underwent major orthopedic and traumatological surgery during the period of our study. Male sex was predominant in 76.2%, i.e. a sex ratio of 3.1, and the most representative age groups were [21-25 years] and [51-55 years], i.e. 11.40% (n=12) and 12.40% (n=13). Coxarthrosis was the predominant surgical indication in 67.50% of cases, followed by traumatic causes in 28.50% and PTH revision in 3.90% (fig.1).

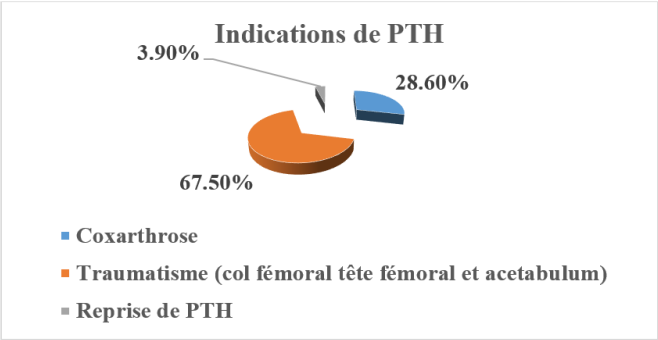


Figure 1: Indications for PTH

According to the overall assessment of anesthetic risk according to ASA criteria, 68.18% (n=30) were ASA I; 29.55% (n=12) ASA III and 2.27% (n=1) ASA IV. Preoperative assessment showed that 56.20% had a preoperative hemoglobin level ≥12g/dl, compared with 34.30% of patients with preoperative hemoglobin levels between 10 and 12g/dl (fig. 2).

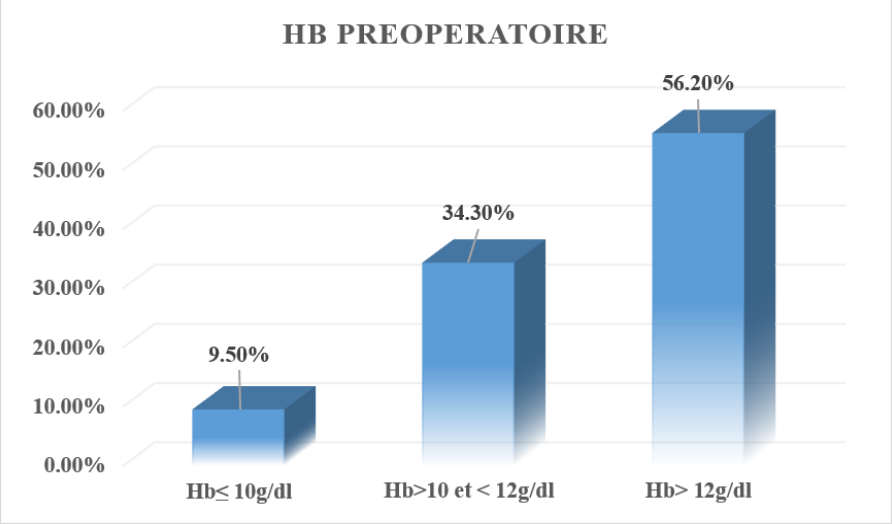


Figure 2: Preoperative hemoglobin values

The average duration of the THP procedure was 120 min, with a minimum duration of 90 min (1 hour), and was longer in repeat THPs (≥180 min) (fig3). The predominant anaesthetic technique was spinal anaesthesia in 74.19% versus 25.81% GA.

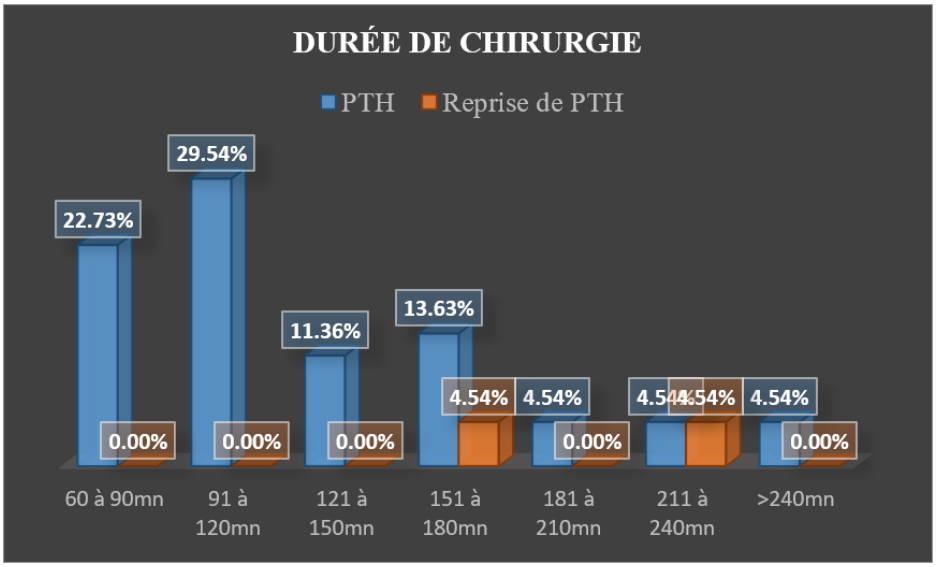


Figure 3: Duration of surgery

Blood-saving strategies were numerous, including the standard surgical technique with different operators. For the transfusion-sparing drug strategy, tranexamic acid (ATX) and iron 100mg were used among the drugs studied (EPO, iron, ATX and Aprotinin).

Figure 4 shows that tranexamic acid was used in the majority of patients: 47.73% (n=21) received a dose of 1g over 30 min before incision and 500mg at the end of the procedure, 25% (n=11) received a dose of 500mg before incision and 500mg/6h/24h, and 11.36% received 1g only at incision (fig4).

The influence of tranexamic acid was assessed intraoperatively, and blood loss was greater in the group that did not receive ATX, with a P-value above the confidence level (0.32 > 0.05). Mean blood loss was 1402 ±375ml in the tranexamic acid-treated groups versus 1875 ±331ml in the non-treated group. Blood loss was greater in PTH retreatment, estimated at over 2000ml.

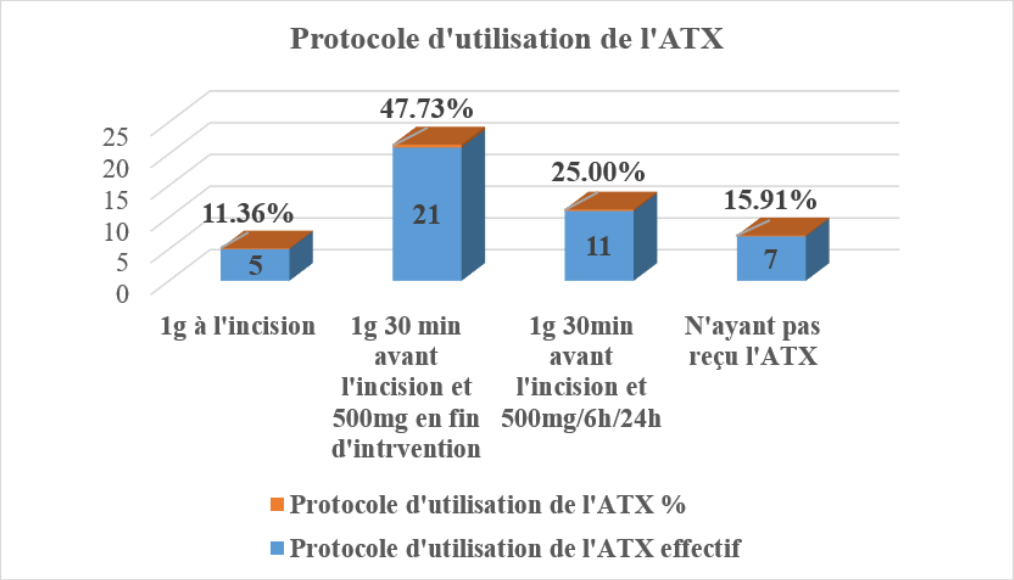


Figure 4: Characteristics of patients receiving ATX under different protocols

We also studied the influence of ATX, iron and their combination on the variation in hemoglobin levels postoperatively, as illustrated in the figure below (fig. 5). We found that 15.45%, 13.64% and 20.45% respectively of patients who received tranexamic acid, iron and their combination, had maintained hemoglobin levels between 10 and 11g/dl; whereas in 100% of the 04 patients who received neither acid nor iron, hemoglobin levels fell between 08 and 10 g/dl.

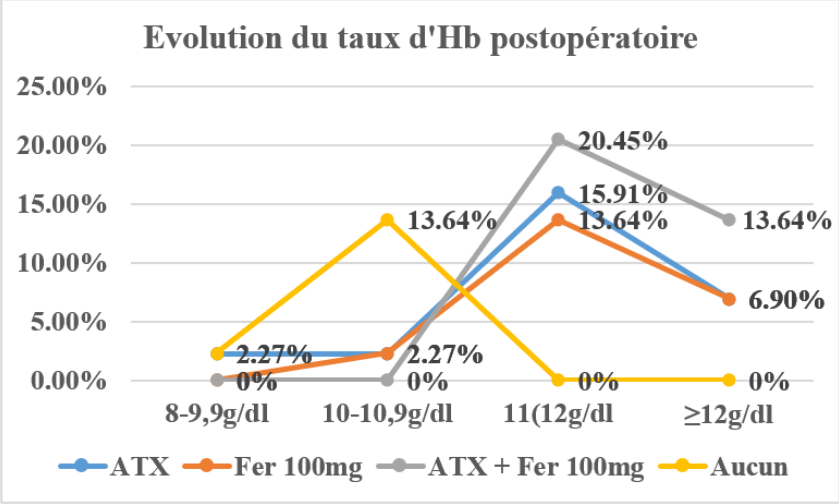


Figure 5: Influence of tranexamic acid (ATX) on postoperative hemoglobin kinetics

We observed an Hb level ≥ 10g/dl in patients who received multimodal analgesia (paracetamol, tramadol) combined with locoregional anesthesia (fig 6).

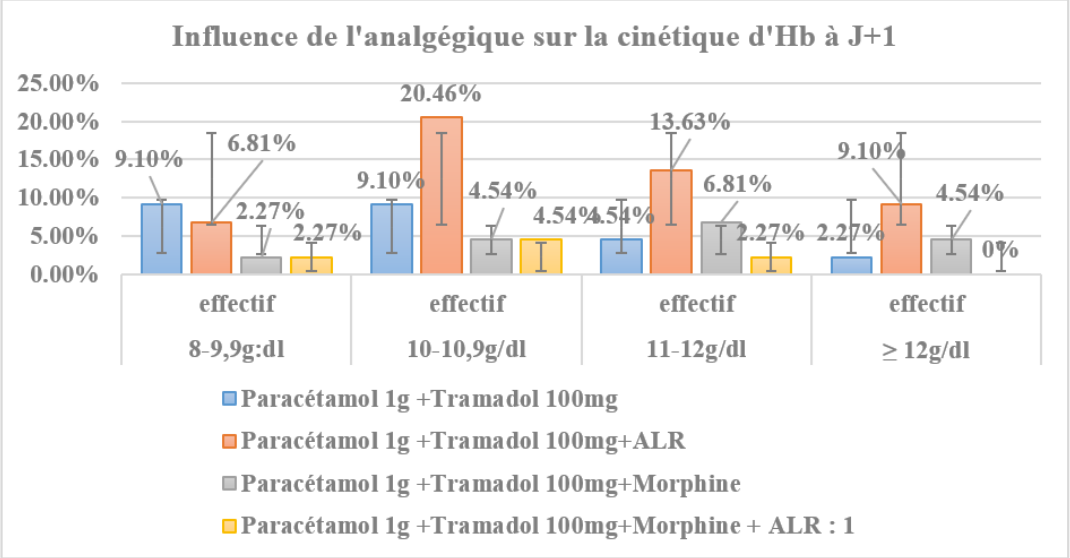


Figure 6: Influence of analgesic on Hb kinetics at D+1

4. DISCUSSION

The predominance of necrotic coxarthrosis (67.50%) as an indication for THR in our series would be related to the advanced age of our patients whose representative age range is 51 to 60 years, 28.50% was due to trauma. Our results are similar to those of the study by Serghini *et al.*, conducted in Morocco in 2015 on PTH anesthesia (based on 50 cases), and half of the indications for PTH were coxarthrosis (58%) [2]. In contrast, the study by Jean Baptiste Ramampisendrahova, Andriamanantsialonina Andrianony *et al.*, reported that femoral trauma and THP were respectively the main procedures performed in orthopedics and traumatology, accounting for 29.5% and 6.3% [3].

In our study 56.20% had preoperative hemoglobin levels ≥12g/dl versus 34.30% of patients with preoperative hemoglobin levels between 10 and 12g/dl. This was observed at least one month before surgery, and patients did not require any special preparation. This result is comparable to the data obtained by PINEAU Florian & RABET Jean who found a prevalence of anemia at 42.6% with a mean hemoglobin value of 11.2 ± 1.4 g/dl [4]. Our data are superior to those of RAKOTOTIANA Sitrakiniaina [5].

WHO recommendations according to Lasocki S. and Rineau E. (2016) define anemia as a decrease in hemoglobin levels below 12g/dl in women and below 13 g/dl in men [6]. An observational study carried out in six European countries on 1,534 patients scheduled for orthopedic surgery (hip, knee and spine) found that 14.1% of patients were anemic preoperatively. Some of the centers in this study were PBM referral centers, and had a lower anemia rate than non-PBM referral centers (8% vs. 18.1M, P<0.001) [7]. Our results suggest the implementation of a transfusion strategy that can reinforce, in particular, the optimization of hemoglobin levels preoperatively in order to cope with intraoperative blood loss.

For the transfusion-sparing drug strategy, tranexamic acid (ATX) and iron 100mg were used among the drugs studied (EPO, iron, ATX and Aprotinin). Tranexamic acid was used in the majority of patients 47.73% (n=21) at a dose of 1g over 30 min before incision and 500mg at the end of the procedure, 25% (n=11) received a dose of 500mg before incision and 500mg/6h/24h and 11.36% received 1g only at incision. We observed greater intraoperative blood loss in the non-ATX group 1,875 ±331ml versus 1,402 ±375ml. Several large-scale Randomized Controlled Trials (RCTs) and meta-analyses have consistently confirmed that intravenous administration of ATX can safely and effectively reduce perioperative blood loss and transfusion requirements in total hip and knee arthroplasty [8].

We also studied the influence of ATX, iron and their combination on the variation in hemoglobin levels postoperatively. We found respectively that 15.45%, 13.64% and 20.45% of patients who received tranexamic acid, iron and their combination, had maintained hemoglobin levels between 10 and 11g/dl; whereas in 100% of 04 patients who received neither acid nor iron, hemoglobin levels fell between 08 and 10 g/dl. Our results are similar to those of Itto A. who observed that postoperative hemoglobin levels fell to 10.29 g/dl in the ATX group versus 9.5 g/dl in the non-ATX group [4]; he concluded that in THP surgery, patients who received tranexamic acid required less transfusion postoperatively [9]. We believe that the synergy between tranexamic acid and iron influenced the increase in Hb levels compared with the results of Itto, who used IV iron alone.

Arana H. and Rabuel C. in their comparative study on the topical use of tranexamic acid in programmed PHT surgery: group with ATX (n=48)

versus without ATX (n=54); post-operative hemoglobin monitoring at D1, D3 and D5 showed a clear difference in the fall in Hb levels in the group without ATX in the immediate post-operative period, and that the effect is maximal at patient discharge; this means less blood loss and fewer deleterious effects observed in the group with ATX with [10].

Houlier H. *et al.*, studied the prophylactic use of tranexamic acid in 209 primary THP procedures, comparing the group receiving 20 mg/kg versus 30 mg/kg ATX; none of the patients were transfused, proving its efficacy [11].

Pain triggers catecholamine (adrenaline) release, which in turn increases cardiac output and blood pressure, thereby increasing perioperative blood loss. Multimodal analgesia in pain management has an impact on postoperative blood loss. In this study, we observed an Hb level ≥ 10g/dl in patients who received multimodal analgesia (paracetamol, tramadol, combined with locoregional anesthesia).

Given the small size of our sample, we cannot be hasty in asserting the beneficial effect of the synergy of tranexamic acid (ATX) and iron per os in our study. However, through this observation we have noted the beneficial effect of using tranexamic acid and iron in THP surgery, and the various reviews of the literature support our daily practice on transfusion-sparing strategies.

5. CONCLUSION

THP surgery is a potentially hemorrhagic procedure; its clinical impact justifies the implementation of a blood-sparing strategy to limit recourse to homologous blood transfusion. Our aim was to evaluate the homologous transfusion-sparing strategy applied for this surgery, essentially the use of tranexamic acid and iron. The majority of studies, as well as our own results, have shown the effectiveness of this strategy in reducing blood loss, with less recourse to transfusion. This encourages us to use the combination of tranexamic acid and iron in total hip replacement (THR) surgery for blood savings. This conclusion will lead us to carry out a prospective study before recommending a possible generalization of the use of tranexamic acid in our sub-region, where the blood supply is still not easy.

5. Authors' Contributions

Beufoutcham Kacharé C: Principal investigator, drafting of the manuscript.

Kader NDIAYE: Patient inclusion and follow-up.

Bonté ADJOUGOULTA KOBOY: Patient inclusion and follow-up.

Yannick Canton KESSELY: Surgeon, patient inclusion and follow-up.

Mahamat Abderraman Guillaume ZALBA: Reading, supervision and final approval of the manuscript.

6. Agreement with the Authors

a) All authors of the manuscript have read and accepted its contents and are responsible for all aspects of the accuracy and integrity of the manuscript;

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

7. Conflicts of Interest

The authors declare that they have no conflict of interest regarding the publication of this article.

BIBLIOGRAPHY

1. Rontes, D.O., Marty, D.P. & Delbos, D.A. (2017). Locoregional anesthesia and hip in elective and emergency surgery.
2. Serghini, I., Qamouss, Y., Zoubir, M., Lalaoui, J. S., Koulali, I. K., & Boughalem, M. (2015). Anesthesia for total hip prosthesis: report of 50 cases. *The Pan African Medical Journal*, *22*, 379-379. Available from: http://www.panafrican-med-journal.com/content/article/22/379/full/
3. Ramampisendrahova, J. B., Andrianony, A., Razaka, A. I., Razafimahatratra, R., & Solofomalala, G. D. (2020). EVALUATION DE LA PERTE SANGUINE DURANT LA PÉRIODE PÉRIOPÉRATOIRE EN CHIRURGIE ORTHOPÉDIQUE ET TRAUMATOLOGIQUE ASSESSMENT OF BLOOD LOSS DURING THE PERIOPERATIVE PERIOD IN ORTHOPEDIC AND TRAUMA SURGERY. *EPH-International Journal of Medical and Health Science*, *6*(4), 13-18.
4. Pineau, F. & Rabet, J. (2021). Prevalence of preoperative anemia in Angevins surgical patients. Angers.
5. Rakototiana, S. (2021). Evaluation of blood loss in orthopedic and trauma surgery at CHU Anosiala. Antananarivo.
6. Lasocki, S., Dupre, P. & Rineau, E. (2016). Indications_du_fer_et_de_l_erythropoietine_en_anesthesie. In Angers; 2016.
7. Bubendorf, T. (2020). Evaluation of Patient Blood Management in orthopaedic surgery at the University Hospitals of Strasbourg: retrospective study.
8. Franchini, M., Marano, G., Veropalumbo, E., Masiello, F., Pati, I., Candura, F., ... & Liumbruno, G. M. (2019). Patient Blood Management: a revolutionary approach to transfusion medicine. *Blood Transfusion*, *17*(3), 191.
9. Itto, A. & Samkaoui, M.A. (2013). Use of tranexamic acid in hip surgery.
10. Arana, H., Gayat, E., Iordache, I., Bucciero, M., Hannouche, D., … & Nizard, R. (2015). Topical use of tranexamic acid in scheduled hip replacement surgery. Anesth-Réanimation. 2015, *1*(S1).
11. Hourlier, H., Reina, N., Fricault, E. & Fennema, P. (2016). Prophylactic injection of tranexamic acid to

reduce perioperative morbidity of THPs. Randomized dose-ranging clinical study. *Rev Chir Orthopédique Traumatol*. 102(Issue 7 Supplement): S89.

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