



Original Research Article

Post-hip arthroplasty hemoglobin monitoring: Evaluating necessity and outcomes

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Abstract

Background: Total hip arthroplasty (THA) is widely regarded as the preferred treatment for severe hip osteoarthritis (OA). Recently, there has been a growing trend toward fast-track treatment protocols, allowing patients to be discharged on the same day as their surgery. This study aimed to evaluate postoperative hemoglobin levels in patients undergoing THA for OA and identify those who would benefit most from these tests.

Materials and Methods: A retrospective review of 213 THA cases was conducted. The study included patients who had THA for OA between 2018 and 2022. A multivariable logistic regression model was used to identify factors associated with postoperative haemoglobin levels <8.5 g/dl and to determine the optimal threshold for identifying patients at risk post-surgery.

Results: Out of the 213 patients, 27 (12.7%) required packed red blood cell transfusions after surgery. The cohort consisted of 109 women (51.2%) and 104 men (48.8%), with an average age of 66.9 ± 11.3 years. Preoperative haemoglobin (Hb) levels were 13.4 ± 1.4 g/dl, while postoperative Hb levels averaged 11.0 ± 1.5 g/dl, indicating a mean reduction of 2.4 ± 1.1 g/dl. Interestingly, 206 patients (96.7%) had a postoperative Hb level above 8.5 g/dl. Univariable analysis showed that lower preoperative Hb levels and younger age were significantly linked to postoperative Hb ≤ 8.5 g/dl ($P < 0.001$). Factors such as sex, hypertension, and dyslipidemia were also significant, whereas no significant associations were observed between Hb <8.5 g/dl and other variables (P -values ranging from 0.995 to 0.998).

Conclusions: The results suggest that routine postoperative blood testing may not be essential for THA patients with OA who experience no complications and have no major underlying health conditions.

Keywords: Osteoarthritis (OA), Total Hip Arthroplasty (THA), Tranexamic Acid (TXA), Electronic Health Records (EHR).

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1. Introduction

End-stage hip osteoarthritis (OA) is commonly managed through total hip arthroplasty (THA), a well-established procedure in contemporary orthopaedic practice.¹ Following major orthopaedic surgeries like THA, blood tests are routinely performed as part of both preoperative and postoperative protocols to support clinical decision-making.² These tests are considered crucial for monitoring potential complications and managing both acute and chronic conditions. Blood loss is a well-documented concern in THA, with a significant number of patients requiring blood transfusions, with rates ranging from 11% to 21% of cases.^{3,4}

With the increasing focus on enhancing recovery times, fast-track surgical protocols, including the use of tranexamic acid (TXA), have been introduced to reduce blood loss and expedite patient recovery.^{2,10} These protocols are designed to optimize various stages of the perioperative process, with the aim of minimizing hospital stays, lowering complication rates, and improving patient experiences, ultimately leading to reduced healthcare costs.⁵ This "fast-track" approach to THA has led to the growing question of whether routine postoperative blood tests are always necessary, particularly in cases where patients have uncomplicated recoveries.^{6,7}

The primary goal of this study was to investigate the necessity of routine postoperative laboratory tests following

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primary, elective unilateral THA for OA and to explore the potential for a fast-track approach in these cases.

2. Materials and Methods

This study was designed as a retrospective cohort analysis. The guidelines of the STROBE checklist were followed to ensure appropriate reporting of the study methodology.⁸ Approval for the study protocol was obtained from the institutional review board of the hospital.

2.1. Participants

The study involved a review of electronic health records (EHR) for 213 patients who underwent total hip arthroplasty (THA) between 2018 and 2022 at a single institution. All procedures were performed using the Corail cementless stem and Pinnacle cementless cup (Depuy Synthes, Warsaw, IN, USA) by a consistent surgical team.²² Inclusion criteria were patients who had undergone THA for osteoarthritis (OA) and had complete demographic and clinical data available, including preoperative haemoglobin (Hb) levels measured within two weeks before surgery, as well as Hb levels on postoperative day 1. The final study population comprised 109 women (51.2%) and 104 men (48.8%).

Data extracted from the EHRs included demographic variables (age, sex), comorbidities, surgical information (e.g., duration, type of anaesthesia, surgeon's experience), the reason for surgery (OA vs. trauma), preoperative Hb values, need for postoperative blood transfusions, and hospitalization details (e.g., length of stay, discharge dates).

2.2. Data analysis

Descriptive statistics were used to summarize the raw data. After ensuring the normality of continuous variables, categorical variables were analysed using the chi-squared test or Fisher's exact test, while continuous variables were compared using the Student's t-test or the Mann-Whitney U test, as appropriate.

After univariable analysis, a multivariable logistic regression model was constructed to assess the factors associated with postoperative Hb <8.5 g/dl. The following variables were included as potential predictors: age, sex, preoperative Hb levels, hypertension, and dyslipidemia. Statistical significance was defined as a P-value of <0.05. All statistical analyses were conducted using SPSS version 28.0 (IBM Corp., Armonk, NY, USA).

3. Results

A total of 213 patients were included in the study, with 109 (51.2%) women and 104 (48.8%) men. The average age of the cohort was 66.9 ± 11.3 years (range: 26 to 87). The mean preoperative haemoglobin (Hb) level was 13.4 ± 1.4 g/dl (range: 9.9 to 17.1), while the mean postoperative Hb was 11.0 ± 1.5 g/dl (range: 7.4 to 15.4). The average decrease in

Hb levels after surgery was 2.4 ± 1.1 g/dl (range: 0 to 5.8). A majority of the patients, 206 (96.7%), had a postoperative Hb level greater than 8.5 g/dl (**Table 1**).

Univariable analysis (**Table 1**) indicated that lower preoperative Hb levels and younger age were significantly associated with Hb levels ≤ 8.5 g/dl ($P < 0.001$). In addition, factors such as sex, hypertension, and dyslipidemia were found to be significant, while other variables did not show a significant association with Hb <8.5 g/dl (P values: 0.995–0.998). The group of 7 patients (3.3%) who had postoperative Hb ≤ 8.5 g/dl had preoperative Hb levels ranging from 9.9 to 12.4 g/dl. These patients were aged between 26 and 65 years.

A multivariable logistic regression analysis was conducted, considering age, sex, preoperative Hb, hypertension, and dyslipidemia as independent variables against the dependent variable of Hb <8.5 g/dl. The model predicted 96.7% of cases correctly, and the constant was found to be statistically significant ($P < 0.001$). Only younger age and low preoperative Hb were significantly associated with Hb ≤ 8.5 g/dl (OR 0.897 [95% CI: 0.81 to 0.994], $P = 0.038$ and OR 0.207 [95% CI: 0.044 to 0.975], $P = 0.046$, respectively). Other factors, including hypertension and dyslipidemia, were not significantly associated with low Hb levels (P values: 0.995–0.998).

A total of 27 patients (12.7%) required packed red blood cell transfusions post-surgery. Patients who received transfusions had significantly lower postoperative Hb levels compared to those who did not (9.0 ± 0.76 g/dl, range: 7.4 to 10.8 vs. 11.4 ± 1.3 g/dl, range: 9.1 to 15.4, $P < 0.001$). All patients in the Hb ≤ 8.5 g/dl group received a transfusion, whereas 20 (9.8%) patients in the group with Hb >8.5 g/dl also required a transfusion (**Table 1**). However, transfusion status was not associated with a specific postoperative Hb cutoff, patient demographics, or medical characteristics ($P > 0.05$).

4. Discussion

As rapid recovery protocols in total hip arthroplasty (THA) continue to evolve, it is important to reassess the necessity of routine postoperative blood testing. Although these tests can provide valuable insights, they may contribute to delays in discharge, which suggests the need for a reevaluation of their widespread use. The purpose of this study was to identify conditions under which routine postoperative blood tests may be unnecessary after standard THA, as well as to highlight scenarios where such testing remains essential.

The study found that younger patients and women were more likely to require a blood transfusion following surgery. Among the younger cohort, only 7 patients (3.3%) required a transfusion, all of whom had postoperative haemoglobin (Hb) levels ≤ 8.5 g/dl.

Table 1: Characteristics and univariable analysis of patients who underwent a total hip arthroplasty due to osteoarthritis, divided by postoperative Hb levels

Variable	Hb >8.5 g/dl (n= 206)	Hb ≤ 8.5 g/dl (n= 7)	Total	p value
Age, years*	67.64±10.5 (35–87)	45.57±14.34 (26–65)	66.91±11.31 (26–87)	<0.001
Sex, male (n, %)	104 (50.5)	0 (0)	104 (48.8)	0.009
Surgery duration*	120.76±39.68 (68–261)	124.6±27.73 (85–155)	120.95±39.066 (68–261)	0.831
Preoperative hemoglobin, g/dl*	13.5±1.46 (10.1–17.1)	11.04±0.92 (9.9–12.4)	13.42±1.15 (9.9–17.1)	<0.001
Postoperative hemoglobin, g/dl*	11.13±1.38 (8.7–15.4)	8.03±0.37 (7.4–8.5)	11.03±1.47 (7.4–15.4)	<0.001
Hb decrease after surgery*	-2.37±1.08 (0–5.8)	-3.01±0.78 (1.8–4.3)	-2.39±1.08 (0–5.8)	0.124
Anesthesia, general vs. spinal (n, %)	86 (41.7)	4 (57.1)	90 (42.3)	0.417
Hypertension (n, %)	109 (52.9)	0 (0)	109 (51.2)	0.006
Dyslipidemia (n, %)	88 (42.7)	0 (0)	88 (41.3)	0.024
DM (n, %)	49 (23.8)	1 (14.3)	50 (23.5)	0.56
Respiratory disease (n, %)	26 (12.6)	0 (05)	26 (12.2)	0.316
Clotting disturbance (n, %)	4 (1.9)	0 (0)0	4 (1.9)	0.71
Vasculopathy (n, %)	22 (10.7)	0 (0)	22 (10.3)	0.361
Cardiac disease (n, %)	39 (18.9)	0 (0)	39 (18.3)	0.203
Smoking (n, %)	37 (92.5)	3 (7.5)	40 (18.8)	0.097
Body mass index *	28.21±5.03 (18.7–42.5)	24.77±3.66 (19.5–27.5)	28.02±5 (18.7–42.5)	0.185
Blood transfusion after surgery (n, %)	20 (9.8)	7 (100)	27 (12.8)	<0.001

*mean ± SD (range)

The concept of fast-track THA aims to optimize patient recovery and minimize hospital stays post-surgery. This approach offers several benefits, including reduced hospitalization time, which contributes to cost savings for both healthcare providers and patients. Additionally, fast-track pain management protocols focus on multimodal pain relief, which can accelerate recovery and enhance patient comfort. Patients undergoing fast-track THA have reported quicker returns to their daily activities and higher overall satisfaction with the process. However, there are risks associated with this approach, such as persistent pain, swelling, and rehabilitation difficulties in 5-15% of cases. Notably, some patients may underutilize pain relief medications, potentially exacerbating pain and swelling. Despite these drawbacks, evidence suggests that fast-track perioperative care and rehabilitation protocols are both cost-effective and clinically beneficial following THA.^{5,17-20}

Several studies have explored the need for postoperative laboratory tests and factors influencing blood loss after THA, such as body mass index (BMI), surgical techniques, and underlying health conditions. Similar to our findings, Yang et al.² found that women were at a higher risk for transfusions after surgery. However, studies including ours did not find a clear correlation between higher BMI and increased blood loss, in contrast to Carling and colleagues,⁹ who identified

low BMI as a risk factor for excessive bleeding in joint arthroplasties. Interestingly, while our study observed a negative relationship between age and blood loss, some previous studies, such as that by Walsh et al.¹⁴ reported that elderly patients tend to experience more bleeding after THA, potentially due to medications or preexisting conditions.

Our study found that patients with Hb ≤8.5 g/dl postoperatively were younger and bled more than those with higher Hb levels. Miao et al.¹³ also identified a negative association between age and blood loss in THA, which aligns with our findings. While it is well-documented that longer surgical duration is associated with more bleeding,^{15,16} we did not observe a correlation between the length of surgery and the amount of blood loss in our study.

With only 3% of patients showing Hb levels below 8.5 g/dl after surgery, our results suggest that routine, extensive Hb monitoring may not be required for the majority of THA patients. Most could safely be discharged on the same day as their surgery, which has significant economic and healthcare implications, particularly about reducing hospital stays.

However, there are limitations to our study, including the relatively small sample size, which reduces statistical power. All surgeries were performed by three attending surgeons at a single public hospital, which may limit the generalizability

of the findings. Additionally, there was no standardized protocol for determining blood transfusion thresholds. Given these limitations, a future multicenter, prospective study with a strict transfusion protocol is warranted to further investigate the value of postoperative blood testing.

5. Conclusions

In conclusion, routine postoperative haemoglobin testing may not be necessary for most patients undergoing THA for OA, especially those without significant complications or underlying health conditions. The findings support the potential for a more streamlined, fast-track approach to THA, which could benefit both patients and healthcare systems by reducing unnecessary testing and hospital stays. However, further research with more comprehensive protocols is needed to confirm these results.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. Ethical Clearance

Ethical No.: MMC- 0157-22MMC.

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