



## A Study to Evaluate the Optimum Timing for Analyzing the Haemoglobin Indices in the Postoperative Period

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### ABSTRACT

**Background:** In the intraoperative period; unless there is a significant hemodynamic change due to acute blood loss, blood transfusion is avoided as much as possible to avoid its complications. Hence most often it is managed with crystalloids and colloids to maintain normovolemia to counter the acute blood loss in surgery. In surgical practice, there are not many available data to assess the best timing in the postoperative period to assess the haemoglobin and hematocrit to decide the need for transfusion. This is vital information as it will help to guide the need for further transfusions. A patient who undergoes major surgery in our hospital most often receives 2 or more units of blood intraoperatively or post-operatively. Hence this study was done to get the optimal value of hematocrit and haemoglobin in the postoperative period in patients who have received a blood transfusion. **Methods:** A retrospective study was done by assessing the records of cases between October 2018 to October 2020, at a tertiary care centre in Mangalore. Case sheets of all adult patients undergoing major surgery under General anaesthesia or central neuraxial blockade were evaluated and the data was analyzed. **Results:** The findings of our study suggest that the levels of haemoglobin are best evaluated at 6 hours post-operatively to decide on the need for transfusion.

**Keywords:** Transfusion trigger; Surgical blood loss; Blood transfusion

### INTRODUCTION

The past few years have seen a dramatic change in the type of surgeries that are done. With the increasing advances that have taken place in the field of medicine and are continuing to take place have made way not only to control diseases but also for major, complex surgeries to be done with ease, especially the ones that were considered rare in the past [1-3].

Most interventions in the medical field are not without complications. One of the most worrisome complications of any major surgery is the amount of blood loss, and how to monitor it and replenish it [4-7].

Blood is a body fluid that is composed of blood cell components like leukocytes, red blood cells, and platelets that remain suspended in plasma. The blood acts as a transporter of nutrients to various parts of the body.

In surgery; unless there is a significant hemodynamic change intra-operative due to acute blood loss or if the surgery is expected to have a massive blood loss no transfusion is done intraoperatively because blood transfusion can cause dilutional coagulopathy and initiate a vicious cycle [8]. Hence most often intraoperatively is managed with intravenous fluids to maintain normovolemia to counter the acute blood loss surgery [9].

This is very vital information as it will help to guide the need for further transfusions.

A patient who undergoes major surgery in our hospital most often receives two or more units of blood intraoperatively or postoperatively.

Hence this study was conducted to get the optimal value of hematocrit and haemoglobin in the postoperative period by assessing patients who have received blood transfusions.

**METHODS**

A retrospective study was done by assessing the hospital records of moderate to major surgical cases between October 2018 to October 2020, at a tertiary care hospital in Mangalore, India. Institutional ethical Committee clearance was obtained and the case sheets of all adult patients undergoing major surgery under GA/SA were evaluated for demographic data such as age, gender, weight, height, date of surgery, the surgery type, and blood group (ABO and Rh). Intra-operative blood loss details, total units of blood transfused, and any intra-operative events were recorded. Preoperative and postoperative, haemoglobin levels and Polycythemia Vera (PCV) were also noted.

**Statistical analysis**

Descriptive and inferential statistics were utilized for data analysis. For assessing differences in quantitative variables across our predefined optimal timing groups (immediate, 6 hrs, 12 hrs, 24 hrs), one-way ANOVA was utilized. For assessment of metric variables across 2 groups (early vs late), independent samples t-test will be employed. All statistical analyses were performed using SPSS v22.0 (IBM Corp, Armonk, NY).

**RESULTS**

We found 150 cases that had records of the data we needed as per the inclusion criteria of age 18 years-60 years, either gender, ASA physical status 1 or 2 and subjected to a major surgery under general anaesthesia or central neuraxial

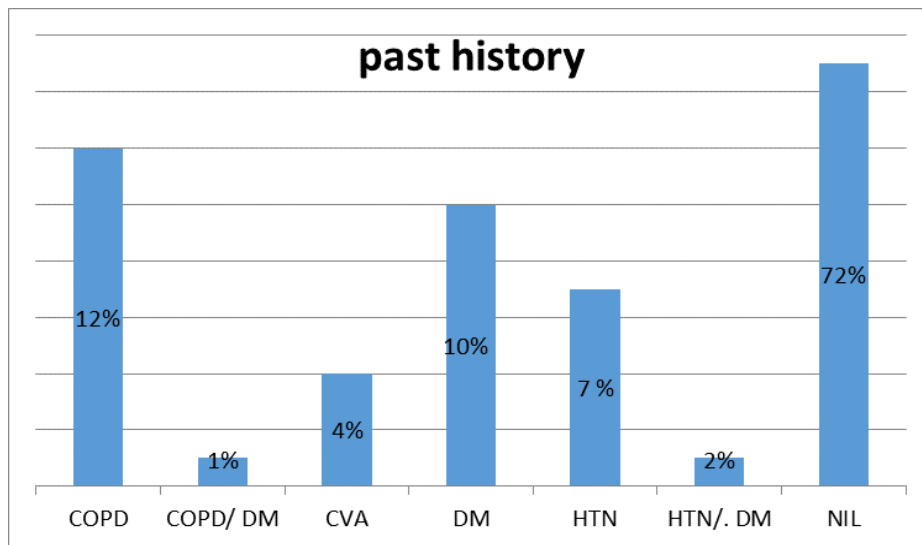


Figure 1 Comorbid conditions in the study population

Table 1 Comparison of Hb levels before and after surgery

| ANOVA               |                | Sum of squares | df | Mean square | Significant     |
|---------------------|----------------|----------------|----|-------------|-----------------|
| Hb (gm/dl) at 12 hr | Between groups | 38.053         | 12 | 3.171       | 0.037           |
|                     | Within groups  | 94.407         | 35 | 2.697       |                 |
|                     | Total          | 132.459        | 47 | 2.934       |                 |
| Hb (gm/dl) at 24 hr | Between groups | 18.18          | 12 | 1.515       | Less than .0001 |
|                     | Within groups  | 0              | 36 | 0           |                 |
|                     | Total          | 18.18          | 48 | 0.7575      |                 |

Table 2 Comparison of Hematocrit levels before and after surgery

| ANOVA                 |                | Sum of squares | df | Mean square | Significant     |
|-----------------------|----------------|----------------|----|-------------|-----------------|
| Haematocrit at 12 hrs | Between groups | 731.066        | 17 | 43.004      | Less than .0001 |
|                       | Within groups  | 0.2            | 31 | 0.006       |                 |
|                       | Total          | 731.265        | 48 |             |                 |
| Haematocrit at 24 hrs | Between groups | 617.428        | 17 | 36.319      | Less than .0001 |
|                       | Within groups  | 0.2            | 31 | 0.006       |                 |
|                       | Total          | 617.628        | 48 |             |                 |

block. The comorbidities of the study population are depicted in Figure 1. Though between the preoperative and postoperative periods there was a significant difference in the levels of haemoglobin; no significant difference in haemoglobin/dl was seen at 6 hrs and 12 hrs, and between haemoglobin/dl at 12 hrs and 24 hrs with a p-value of 0.9 and 0.78 respectively as shown in Table 1.

However, between the preoperative and postoperative periods there was a significant difference in the levels of hematocrit at 6 hrs and 12 hrs and at 12 hrs and 24 hrs with a p-value of 0.01 in each group as shown in Table 2.

### DISCUSSION

Most of the time it is the evaluation of the haematocrit and haemoglobin in the postoperative period that dictates and guides the need for transfusion following major surgeries and assesses the blood loss that has taken place during major surgeries compared with the pre-operative haematological parameters [10,11].

As optimal haemoglobin is required for wound healing and the general well-being of the patient it is often a routine practice that the patients are transfused one or more units of whole blood or packed cells during surgery or the post-operative period [12].

Post-operative haemoglobin and haematocrit should be around 10 gm/dl and 30% respectively is essential for the good recovery of surgical patients [13].

Despite the significance of monitoring haematocrit and haemoglobin postoperatively in clinical settings, the literature on optimal timing for assessing the haematocrit and haemoglobin concentration during the postoperative period is very limited.

The human body consists of 5 liters of blood most of which is fluid and acts transporter of oxygen and nutrients to the various tissues in the body and also helps in the removal of waste products of metabolism from the tissues. Measurement of the amount of the oxygen-carrying capacity of the blood is done in the form of haemoglobin [14].

Normally in a healthy adult, the erythrocytes makeup, up approximately 40% to 48% of the blood components but this value can be as high as 60% in a neonate [6].

The recent data available suggests that the human blood-microbiome exists and plays an important part in both health and disease [14].

In a post-operative patient, it is difficult to assess the timing, hence the present study was undertaken to know which time is the best to draw the blood for estimation of haematocrit and haemoglobin.

In this study, we measured the haemoglobin and haematocrit after shifting to the preoperative room before surgery, immediately after shifting the patient to the recovery room or the post-operative ward, and later at 6 hr, 12 hr, and 24 hr post-operative and determined their influence on predicting the need for transfusion requirements. Haemoglobin variations are higher as compared to the haematocrit levels as the haematocrit levels increase more following transfusion as compared to the haemoglobin levels.

### CONCLUSION

Haemoglobin and haematocrit variation begins at 6 hrs post-acute blood loss and the variation remains for about 24 hrs post-surgery. We suggest that the levels of haemoglobin be checked at 6 hours to decide on the need for transfusion.

### DECLARATIONS

#### Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### REFERENCES

- [1] Cabrales, Pedro, and Juan C. Briceno. "Delaying blood transfusion in experimental acute anaemia with a perfluorocarbon emulsion." *The Journal of the American Society of Anesthesiologists*, Vol. 114, No. 4, 2011, pp. 901-11.
- [2] Wedgwood, J. J., and J. G. Thomas. "Perioperative haemoglobin: an overview of current opinion regarding the acceptable level of haemoglobin in the peri-operative period." *European journal of anaesthesiology*, Vol. 13, No. 4, 1996, pp. 316-24.
- [3] Hoque, Md Mazharul, et al. "Equilibration and increase of haemoglobin concentration after one unit whole blood

- transfusion among patients not actively bleeding." *Journal of Dhaka Medical College*, Vol. 23, No. 2, 2014, pp. 161-66.
- [4] Elizalde, J. Ignasi, et al. "Early changes in haemoglobin and hematocrit levels after packed red cell transfusion in patients with acute anemia." *Transfusion*, Vol. 37, No. 6, 1997, pp. 573-76.
- [5] Audu, L. I., et al. "Posttransfusion haematocrit equilibration: Timing posttransfusion haematocrit check in neonates at the National Hospital, Abuja, Nigeria." *International Journal of Pediatrics*, Vol. 2015, 2015.
- [6] Mitchell, Matthew D., et al. "Transfusion thresholds for major orthopaedic surgery: a systematic review and meta-analysis." *The Journal of arthroplasty*, Vol. 32, No. 12, 2017, pp. 3815-21.
- [7] Laurén, E., et al. "Red blood cell transfusion in southern Finland from 2011 to 2016: a quality audit." *Transfusion Medicine*, Vol. 29, No.1, 2019, pp. 41-47.
- [8] Carson, Jeffrey L., et al. "Transfusion triggers: a systematic review of the literature." *Transfusion medicine reviews*, Vol. 16, No. 3, 2002, pp. 187-99.
- [9] Carson, Jeffrey L., et al. "Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion." *Cochrane database of systematic reviews*, Vol. 10, 2016.
- [10] Ryan, Sean P., et al. "Preoperative haemoglobin predicts postoperative transfusion despite antifibrinolytics during total knee arthroplasty." *Orthopaedics*, Vol. 42, No .2, 2019, pp. 103-09.
- [11] Kim, K-I., et al. "Low haemoglobin A1C increases the risk of disability in community-dwelling older non-diabetics adults." *The journal of nutrition, health & ageing*, Vol. 20, No. 3, 2016, pp. 341-46.
- [12] de Lima Marinho, Cirlene, et al. "Predictive models of six-minute walking distance in adults with sickle cell anaemia: Implications for rehabilitation." *Journal of bodywork and movement therapies*, Vol. 20, No. 4, 2016, pp. 824-31.
- [13] Klika, Alison K., et al. "Primary total knee arthroplasty allogeneic transfusion trends, length of stay, and complications: nationwide inpatient sample 2000–2009." *The Journal of arthroplasty*, Vol. 29, No. 11, 2014 pp. 2070-77.
- [14] Bini, Stefano A., et al. "Risk factors for reaching the post-operative transfusion trigger in a community primary total knee arthroplasty population." *The Journal of Arthroplasty*, Vol. 33, No. 3, 2018, pp. 711-17.