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Haematological and Coagulation Disorders and Anaesthesia

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ABSTRACT

Background: Anesthesia is an influential factor in medical data and procedures for patients suffering from haematological and coagulation disorders. Objective: This study is interested in determining clinical outcomes of anesthesia-related to haematological and coagulation disorders. Patients and methods: We conducted a cross-sectional study to analyze the results of anesthesia associated with haematological and coagulation disorders, recruiting 133 patients whose ages ranged between (30 - 50) years who underwent various surgeries in different hospitals in Iraq for a period that included between March 16th, 2022, and October 9th, 2023. This study recorded the results of data related to patients after anesthesia and after completing the surgical procedure for all patients. The data included bleeding, high blood pressure, high heart rate, blood transfusion, and mortality rate. Results: The clinical results of the patients showed that patients between the ages of 45-50 were the majority of patients who were exposed to blood

disorders and that male patients were more likely to suffer at a rate of 63.91% compared to females at 36.09%. Data was also found on the anesthesia used, where general anesthesia was 64 and spinal anesthesia was 64. 41, and regional anesthesia was 28. Surgical data were recorded for the patients who underwent these surgeries, which included Orthopedic, which included 67 patients; Hemorrhoids, which included 25 patients; Total Hip Surgery, which included 20 patients; Appendix Surgery, which included 12 patients; and Breast Cancer Surgery, which included nine patients. This study showed the results of the effect of anesthesia on the dermatological and coagulation disorders of patients, as it included the results of blood parameters after 24 hours, which included RBC (72.13 ± 3.5), white blood cells (104.21 ± 6.86), and hemoglobin (8.5 ± 0.275). Conclusion: Although the use of anesthesia is considered necessary for patients during surgical operations, it causes severe complications for patients who suffer of Haematological and coagulation disorders as well as.

Introduction

"Anesthesia is an important part of medical procedures. However, its effects on patients with blood as well as blood clotting conditions must be carefully considered [1]." Anesthesia, according to research, can impact the coagulation cascade, potentially causing difficulties in people who already have clotting abnormalities [2]. Before giving anesthesia, healthcare personnel must extensively analyze the patient's medical history, particularly their coagulation profile. Furthermore, various anesthetic drugs, including local anesthetics, may affect clotting factors in different ways [3]. While anesthetic management procedures have developed to tackle these issues, further study is required to better understand the connection among anesthesia and blood coagulation disorders in order to provide safe and effective anesthesia administration for patients." [4]

In seriously injured patients or major operations, but their use can also be associated with sometimes significant risks in terms of infection risk, acute lung damage, or possibly even an increased tumor risk [5]. Therefore, the indications for foreign blood administration must be known exactly, but also the correct procedure for blood transfusion as well as all measures to prevent a transfusion in the best possible way [6,7]. Erythrocyte concentrates (EK) are obtained by centrifugation and filtration from fresh whole blood of a single donation. Leukocytes and platelets, as well as cell-free plasma, remain. The standard removal of the leukocytes is necessary to prevent the transmission of cell-dependent viruses and immunization against leukocyte antigens; one, therefore, speaks of the "leukocyte-depleted" [8-10]. From 500 ml of whole blood, approx. 220-330 ml of EK with a hemoglobin content between 17 and 25 g/dl (hematocrit 50-75%) and about 250 ml of fresh plasma are produced. EK can be stored under optimal conditions and at a temperature of +4°C ± 2°C for up to 49 days [11]. In addition to the

most commonly used leukocyte-depleted EC, other special preparations are available. Frozen fresh plasma (GFP) or "freshly frozen plasma" (FFP) can be obtained from whole blood from a single donation with about 270 ml of whole blood GFP or by apheresis with about 600-900 ml of apheresis GFP, which is then divided into portions à 200-300 ml [12-14]. Depending on the method of production, GFP contains small amounts of leukocytes and platelets [15]. The GFP is then shock-frozen to at least -30 ° C. within six h and thus preserved for 1-2 years, the activity of the labile coagulation factors being preserved [16,17]. Four months after the donation, a serological examination of the GFP donor for specific virus markers (HIV, HBV, HCV) is carried out as long as the GFP remains in "quarantine storage" [18,19]. The GFP can only be used if the serological examinations have been negative. Once thawed, GFP must be transfused within 6 hours. [20]

Patients and methods

For the cross-sectional study to analyze the effect of anesthesia on haematological and coagulation disorders, 133 patients who underwent multiple and various surgeries in different hospitals in Iraq were recruited for a period that included between March 16th, 2022, and October 9th, 2023. This study collected demographic characteristics related to clinical data for patients whose ages ranged between (30-50) years. These characteristics included age, gender, body mass index, comorbidities, types of anesthesia used, marital status, and level of education.

This study recorded the clinical data of the patients as all patients underwent general anesthesia, spinal anesthesia, and regional anesthesia during surgical procedures, which included orthopedic, hemorrhoidal, total hip, appendix, and breast cancer, as well as the overall surgical time for each patient and each surgery.

This study determined the results of laboratory tests provided to patients before surgery, including hematocrit, platelet serum creatinine, total bilirubin, and activated partial thromboplastin time. Furthermore, this study determined the effects of anesthetics on patients' hematological and biochemical parameters at 0, 10 minutes, and 24 hours.

This study recorded the results of data related to patients after anesthesia and after completing the surgical procedure for all patients. The data included bleeding, high blood pressure, high heart rate, blood transfusion, and death rate, as the examinations were based on the number of cases who underwent surgery in total. Furthermore, this study identified key hospital- and central-care parameters, including length of hospital stay and proportion of patients who had unplanned 20-day readmission and postoperative follow-up. All results and clinical data specialized on the effect of anesthesia on blood and coagulation disorders were analyzed by the SPSS program, version 22.0.

Results

Table 1: Determine the basic characteristics of the patient data identified in this study.

Characteristics	Number of patients [133]	Percentage [%]
Age		
30 – 35	17	12.78%
36 – 40	21	15.79%
41 – 44	45	33.83%
45 – 50	50	37.59%
Sex		
Males	85	63.91%
Females	48	36.09%
Comorbidities		
No of comorbid	45	33.83%
Hypertension	60	45.11%
Diabetes	56	42.11%
Chronic kidney disease	37	27.82%
Cardiovascular disease	20	15.04%
Renal failure	23	17.29%
BMI [Kg/m2]		
18.5 – 24.9	30	22.56%
25 – 29.9	45	33.83%
> 30.0	58	43.61%
Types of anesthesia used		
GA	64	48.12%
SA	41	30.83%
RA	28	21.05%

Marital status		
Single	22	16.54%
Married	74	55.64%
Divorced	37	27.82%
Education Level		
Primary school	16	12.03%
Secondary school	25	18.80%
Under graduated college	34	25.56%
Post-graduate college	58	43.61%

Table 2: Surgical findings.

Variables	**Findings**
Age at procedure – [mean ± SD], years	46.7 ± 15.3
Types of surgeries	
Orthopedic	67 [50.38%]
Hemorrhoids	25 [18.8%]
Total hip	20 [15.04%]
Appendix	12 [9.02%]
Breast cancer	9 [6.77%]
Operative time	
Orthopedic, hours	1.63 ± 0.35
Hemorrhoids, minutes	45.23 ± 10.61
Total hip hours	1.53 ± 0.03
Appendix, minutes	26.40 ± 4.81
Breast cancer, hours	2.41 ± 0.30

Table 3: Preoperative laboratory outcomes.

Items	**Values**

Hematocrit, %	38.5 [27.2 – 48.66]
Platelets, B/L	277.62 [40.70 – 539.28]
Serum creatinine, mg/dL	0.87 [0.68 – 1.33]
Total bilirubin, mg/dL	0.40 [0.235 – 1.0]
Activated partial thromboplastin time, sec	37.5 [25.73 – 81.68]

Table 4: Determine the anesrthesia impact on haematological and biochemical parameters related to patients in this study.

Haematological parameters

Parameters	**0**	**10 min**	**24 hours**
RBC [$\times\ 10^6 mm^{-3}$]	78.53 ± 2.13	74.52 ± 2.12	72.13 ± 3.5
WBC [$\times\ 10^6 mm^{-3}$]	134.24 ± 6.43	97.65 ± 4.6	104.21 ± 6.86
Hemoglobin [$g\ dL^{-1}$]	7.68 ± 1.24	6.42 ± 0.15	8.5 ± 0.275
Hematocrit (%)	44.13 ± 0.31	33.57 ± 0.58	38.56 ± 0.67
MCV (Fl)	461.38 ± 2.53	445.50 ± 2.20	459.32 ± 8.68
MCH (pg)	92.14 ± 1.35	86.77 ± 1.21	90.21 ± 3.65

Biochemical parameters

TP [$g\ L^{-1}$]	42.10 ± 2.40	43.80 ± 2.70	45.11 ± 2.60
ALB [$g\ L^{-1}$]	8.22 ± 1.874	7.75 ± 0.43	7.86 ± 0.80
ALT [$mmol\ L^{-1}$]	0.87.53 ± 0.363	0.54 ± 0.31	0.74 ± 0.34
AST [$\mu Kat\ L^{-1}$]	1.74 ± 0.46	1.24 ± 0.57	1.47 ± 0.70
ALP [$\mu Kat\ L^{-1}$]	0.60 ± 0.21	0.53 ±0.30	0.62 ± 0.1

Table 5: Post-operative findings.

Values	Number of patients [133]	Percentage [%]
Bleeding, N [%]		
Yes	12	9.02%
No	121	90.98%
High heart rate, N [%]		
Yes	8	6.02%
No	125	93.98%
High blood pressure, N [%]		
Yes	14	10.53%
No	119	89.47%
Blood transfection, N [%]		
Yes	12	9.02%
No	121	90.98%
Mortality, N [%]		
Yes	16	12.03%
No	117	87.97%
Unplanned 20-day readmission	3	2.26%
Length of stay in hospital, [mean ± SD], Days	7.6 ± 2.15	
Follow-up, [mean ± SD], Months	2.50 ± 0.78	

Discussion

The clinical results of the patients showed that the patients whose ages ranged between 45-50 were most patients who were exposed to blood disorders. Male patients were more likely to suffer from blood disorders, at a rate of 63.91%, compared to females, 36.09%. The patients also had no concomitant diseases 45, while the remaining patients suffered from Chronic comorbidities, most of which were hypertension with 60 cases, diabetes with 56 cases, chronic kidney failure with 37 cases, cardiovascular diseases with 20 cases, and kidney failure with 23, where body mass index rates (18.5 - 24.9) were found to reach 22.56% of the total patients, (25 - 29.9) was 33.83% of the total patients, > 30.0 was 43.61% of the total patients, and the anesthesia data used were recorded as general anesthesia was 64, spinal anesthesia was 41, and regional anesthesia was 28.

The surgical data for the patients was recorded to record the average age at the time of the surgical procedure, which was (46.7 ± 15.3), while the data collected for the patients included only patients who underwent these surgeries, as it included Orthopedic, which included 67 patients, and the surgical time was (1.63 ± 0.35) hours, and Hemorrhoids, which was 25 patients. The surgery time was (45.23 ± 10.61) minutes; total hip surgery, which included 20 patients, with an operating time of (1.53 ± 0.03) hours; Appendix surgery, which included 12 patients, with a surgical time of (26.40 ± 4.81) minutes; Breast cancer surgery, which included nine patients with (2.41 ± 0.30) hours.

Preoperative laboratory results were determined in the medical tests and examinations that the patients underwent. Hematocrit was 38.5 [27.2 – 48.66], Platelets was 277.62 [40.70 – 539.28], Serum creatinine was 0.87 [0.68 – 1.33], Total bilirubin was 0.40 [0.235 – 1.0], activated partial thromboplastin time was 37.5 [25.73 – 81.68].

This study showed the results of the effect of anesthesia on the dermatological and coagulation disorders of patients, as it included the results of blood parameters after 24 hours, which included RBC was (72.13 ± 3.5), white blood cells were (104.21 ± 6.86) and hemoglobin was (8.5 ± 0.275), while the results of biochemical parameters after 24 hours which included TP was (45.11±2.60), ALB was (7.86±0.80), ALT was (0.74±0.34), AST was (1.47±0.70) and ALP was (0.62±0.1).

Postoperative clinical data for pooled samples were recorded as patients who had bleeding in 12 patients, hypertension in 14 patients, high heart rate in 8 patients, mortality in 16 patients, and patients who underwent unplanned readmission for 20 patients. Days, which included 3 cases. The average length of stay in the hospital was (7.6 ± 2.15) days, and the postoperative follow-up was (2.50 ± 0.78) months.

Some studies have shown that anesthesia may have a negative effect on patients on the number of blood cells and the balance between coagulation, as well as the presence of fibrinolysis, which causes patients who suffer from blood disorders to be more susceptible to bleeding and clotting complications after surgery [21,22]. Another study confirmed that anesthesia has effects and coagulation on red and white blood cells, which is attributed to causing abnormalities in the blood clotting process, specifically on the platelets of patients, which results in excessive bleeding for patients during or after surgery [23]. American study confirmed that the management of the hospital and laboratories for patients has a role in managing patients and monitoring the patient's coagulation status during laboratory tests, including activated partial thromboplastin time (aPTT), platelet count and fibrinogen levels, which may contribute to determining the risk of malformations causing patients while they are exposed to anesthesia during surgical operations. [24]

Conclusion

This study indicated that anesthesia often has a negative effect on blood cells and clotting factors, as well as the balance between coagulation. Anesthesia poses negative consequences for patients suffering from blood disorders, causing severe complications such as bleeding or clotting complications, which makes it difficult to improve the management of patients during surgical operations.

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