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Clinical commentary

Risk factors for platelet transfusion in glioblastoma surgery

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ABSTRACT

The objectives of this study are to identify risk factors for and to evaluate clinical outcomes of platelet transfusion in glioblastoma surgery. The medical records of adult patients who underwent craniotomy for glioblastoma resection at a single academic medical center were retrospectively reviewed. We stratified patients into 2 groups: those who were transfused at least 1 unit of platelets intraoperatively or postoperatively (no more than 7 days after surgery), and those who were not transfused with platelets. Through the use of a 1:3 matched cohort analysis, we compared complications, length of stay, discharge disposition, and mortality, across groups. One hundred and five consecutive adult patients were included in this study. Thirteen patients (12.38%) received platelet transfusions. Prior antiplatelet therapy (odds ratio [OR] 8.21, 95% confidence interval [CI]: 2.36–28.58), preoperative platelet count less than 200,000 cells/μL (OR 8.46, 95% CI: 2.16–33.22), and longer operative times (OR 1.73, 95% CI: 1.10–2.72) were significant risk factors for platelet transfusion. There were no significant differences in the outcomes of interest in the matched cohort analysis.

1. Introduction

Risk factors for and outcomes of platelet transfusion in the setting of glioblastoma surgery have yet to be described. Guidelines from the American Association of Blood Banks recommend that platelets be transfused to reduce the risk of spontaneous bleeding in hospitalized adult patients with a platelet count ≤10,000 cells/μL [1]. There are 2 strategies for platelet transfusion: prophylactic transfusion is used to prevent spontaneous bleeding, while therapeutic transfusion is used to treat active bleeding, such as intraoperative hemorrhage, or in preparation for an invasive procedure that has the potential to cause significant bleeding. The risks and benefits of those strategies continue to be evaluated [2–6].

In our practice, we noticed a trend in the transfusion of blood products, whereby platelets were generally transfused in patients who had surgery for glioblastomas, whereas red blood cells were generally transfused in patients who had surgery for non-glioblastomas. Thus, we sought to determine risk factors for platelet transfusion in glioblastoma surgery.

We present a retrospective cohort study of adult patients who underwent resection of a glioblastoma over the past 4 years at our institution and compared patients who were transfused platelets in the intraoperative or postoperative period to patients who had not received any platelets. The study aims were to evaluate risk factors for platelet transfusion and to compare outcomes between transfusion and no-transfusion groups. The primary outcomes of interest included in-hospital complication rate, length of stay, discharge disposition, and mortality rate.

2. Methods

2.1. Study design

The medical records of consecutive patients who underwent craniotomy for tumor resection at the Ronald Reagan UCLA Medical Center (Los Angeles, CA) between March 2013 and January 2017 were retrospectively reviewed to identify adults (18 years

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and older) who were diagnosed with glioblastoma. Identified patients were divided into 2 groups: those who were transfused at least 1 unit of platelets intraoperatively or postoperatively (no more than 7 days after surgery; transfusion group) and those who were not transfused with platelets (no-transfusion group). The study protocol was approved by the UCLA Institutional Review Board and the Office of the Human Research Protection Program prior to data collection.

2.2. Data collection

Demographics (age, sex, and race), medical histories, platelet counts, hemoglobin values, prothrombin times, International Normalized Ratios, radiologic reports, clinical and operative notes, and blood bank reports were reviewed. To be included in the study, antiplatelet drugs must have been discontinued 6 days prior to surgery. Patients without a baseline platelet count, hemoglobin value, and/or International Normalized Ratio were excluded. Platelet counts were trended through the hospitalization for the transfusion group (Fig. 1). Tumor size was recorded as the largest maximal diameter on the axial plane of preoperative magnetic resonance imaging of the brain. American Society of Anesthesiologists class was retrieved from the anesthesiologists' preoperative notes.

Operative time, estimated blood loss (EBL), and extent of resection were retrieved from the operative note. In-hospital complications were identified in the discharge summaries and included seizure, stroke, return to the operating room, and other neurologic deficits. The first available platelet counts and hemoglobin values after surgery were also collected. Platelet transfusion parameters (transfusion indication, duration from incision to transfusion of the first unit of platelets, total number of units transfused, and total volume of platelets transfused) were retrieved from the blood bank reports. Of note, pretransfusion platelet counts were rarely ordered for patients who received intraoperative platelet transfusion (for active bleeding).

2.3. Statistical analysis

Comparisons of continuous variables were performed using Student's *t* tests or Mann-Whitney *U* tests for parametric and non-parametric variables, respectively. Contingency tables for categorical variables were performed using Fisher exact tests. Through the use of a 1:3 matched cohort analysis, 13 transfusion patients were matched to 39 control patients who had comparable preoperative platelet counts, hemoglobin values, and prior antiplatelet therapy status. Cohort matching was performed to isolate the treatment effect of platelet transfusions on the primary outcomes of interest: in-hospital complication rates, length of stay (LOS), discharge disposition, and mortality. We performed Pearson

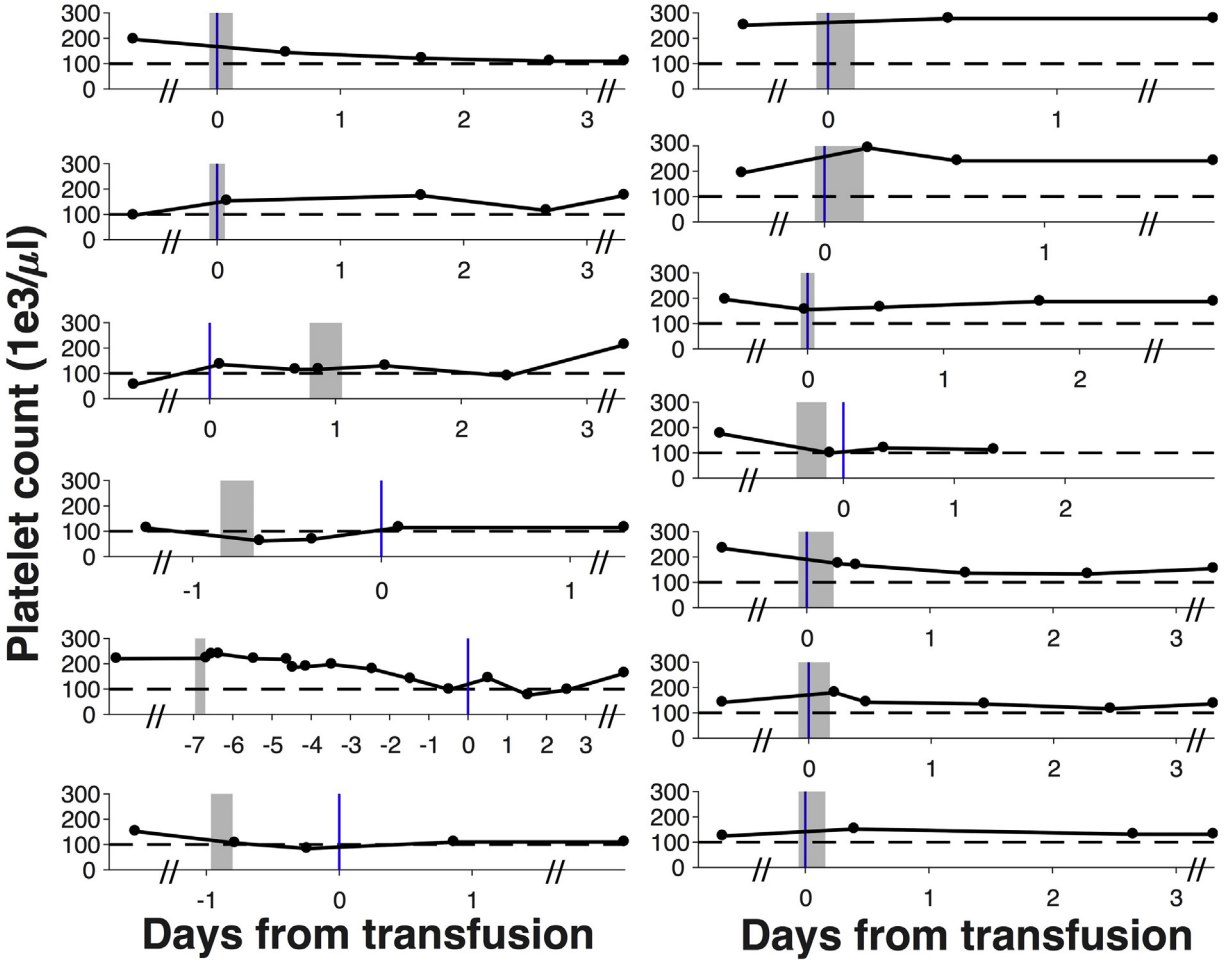

Fig. 1. Platelet count trends for patients in the transfusion group. The shaded box represents the surgical procedure (craniotomy for tumor resection) and the blue line represents the first platelet transfusion. Double line breaks on horizontal axis delineate a perioperative window extending 72 postoperative hours. Data points to the left of the first set of double line breaks indicate baseline preoperative platelet counts obtained closest to the time of surgery. Data points to the right of the second set of double line breaks indicate the last available postoperative platelet counts.

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