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Red Cell Distribution Width: an Unacknowledged Predictor of Mortality and Length of Stay following Revision Arthroplasty

Pouya Alijanipour, MD  
*Rothman Institute at Thomas Jefferson University*

Snir Heller, MD  
*Rothman Institute at Thomas Jefferson University, snir.heller@rothmaninstitute.com*

Fatih Kucukdurmaz, MD  
*Rothman Institute at Thomas Jefferson University, fatih.kucukdurmaz@rothmaninstitute.com*

Benjamin Zmistowski, MD  
*Rothman Institute of Orthopedics, Thomas Jefferson University Hospital, Benjamin.Zmistowski@jefferson.edu*

Maryam Rezapoor, MS  
*Rothman Institute at Thomas Jefferson University, maryam.rezapoor@rothmaninstitute.com*

See next page for additional authors

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Authors
Pouya Alijanipour, MD; Snir Heller, MD; Fatih Kucukdurmaz, MD; Benjamin Zmistowski, MD; Maryam Rezapooy, MS; and Javad Parvizi, MD, FRCS
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Pouya Alijanipour MD, Snir Heller MD, Fatih Kucukdurmaz MD, Benjamin Zmistowski MD, Maryam Rezapoor MS, Javad Parvizi MD, FRCS.

Investigation performed at the Rothman Institute at Thomas Jefferson University, Philadelphia, PA.

INTRODUCTION

Red cell distribution width (RDW), a measure of variability in size of circulating erythrocytes, is routinely reported in complete blood cell analysis, and together with mean cell volume (MCV) has conventionally been used to distinguish the cause of anemia. It is calculated by (Standard deviation of MCV/ mean MCV) x 100, with normal range being 11.5%-14.5%.

Several recent publications have described RDW as an independent predictor of adverse outcome and mortality in patients with different underlying medical conditions such as acute and chronic heart failure, peripheral artery disease, chronic pulmonary disease and acute kidney injury. The purposes of this study were 1) to investigate possible treatment for adverse outcome and mortality in patients with different underlying medical conditions, and 2) to determine predictive models for LOS and mortality based on preoperative patient-related factors including RDW values.

In this single institutional retrospective study, 2,261 patients who underwent revision hip or knee arthroplasty during 2000-2009 were included. Postoperative LOS and mortality at one, three, and twelve months were assessed. Patients with hereditary anemia hip or knee arthroplasty during 2000-2009 were included. Postoperative LOS and mortality at one, three, and twelve months were assessed. Patients with hereditary anemia were excluded because of their effect on RDW values. Multivariate analysis was built based on preoperative patient-related factors.

MATERIALS AND METHODS

Strong correlation existed between preoperative and postoperative RDW values (Figure 1 and Table 1). Therefore, only preoperative RDW values were analyzed in this study to eliminate the potential confounding influence of surgical and postsurgical care.

RESULTS

There was statistically significant yet weak correlation between RDW values and Charlson comorbidity index (CCI) (Spearman’s ρ: 0.16, p=0.005). RDW values were higher in patients who died at one (15.4 versus 14.1, p=0.031), three (15.6 versus 14.1, p=0.002), and twelve (15.4 versus 14.1, p=0.001) months. In multivariate analysis, age, male gender, CCI, and preoperative RDW values were independently correlated with mortality at all time points (Tables 2 and 3). Prediction models for LOS and mortality were developed (Figures 2 and 3). Preoperative RDW was an independent predictor of LOS and mortality. RDW should be analyzed as part of the routine perioperative work-up and used to counsel patients on their postoperative risk.

DISCUSSION

RDW is an inexpensive parameter that can serve as an independent predictor of mortality and LOS following revision TJA. Although RDW was correlated with CCI, it was an independent predictor of LOS and mortality. RDW should be analyzed as part of the routine perioperative work-up and used to counsel patients on their postoperative risk. Higher RDW values (anisocytosis) might reflect the sum of multiple physiologic impairments that have considerable influence on erythrocyte progenitors ultimately leading to an adverse outcome.

REFERENCES