Predicting the Necessity of Routine Postoperative Laboratory Tests After Primary Total Hip Arthroplasty

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INTRODUCTION:

With the development of fast-track and outpatient total hip arthroplasty (THA) protocols, several new practices have been introduced in order to help accelerate time to discharge, especially in regards to implant selection, type of anaesthesia and perioperative pain management. Recently, the routine use of traditional laboratory tests following THA has been called into question. Although electrolyte, glycemic and haematological abnormalities had been associated with adverse events following surgical procedures, the prevalence of such abnormalities remain unclear after primary THA. We aimed to describe a predictive model for postoperative abnormal laboratory test in THA patients in order to guide clinical decision-making.

METHODS: We retrospectively analysed 4000 patients who underwent primary THA between 2016-2020, of which 1499 cases were excluded due to lack of complete laboratory results on the electronic medical records, and 63 cases were excluded for being one-stage bilateral THAs. We finally included 2438 patients who underwent unilateral THA consisting of 1476 females (60.55%) with a mean age of 70.2±13 years. Patients' comorbidities, preoperative and postoperative laboratory values were recorded. An abnormal laboratory test was considered as any value that required a medical intervention during the patient's hospitalisation (e.g., physician consultation, transfusion, electrolyte supplementation, etc.). Abnormal values were as follows: serum creatinine >1.2 gr/dL for males and >1 gr/dL for females (or an increase >0.3 gr/dL compared to preoperative creatinine); glycemia <70 or >180 mg/dl; haematocrit <25% or >47%; haemoglobin <8 g/dl; leukocytes <1500 or >50000 mm/3; platelet count <100000 mm/3; potassium <3.5 or >5 meq/L; sodium <130 or >145 meq/L. Univariate associations between preoperative and postoperative laboratory variables were evaluated, after which a predictive model was generated, using a validation cohort including 70% of the population (n=1707) and a generation cohort with the remaining 30% (n=731). A *forward modelling* strategy was used to add variables. The model discriminatory performance was measured using the time-dependent receiver operating characteristic (AUROC) curve. The calibration-in-the-large (CITL) was calculated as the logistic regression model intercept. A score was created calculating the sensitivity and specificity of each point to determine the best cut-off point.

RESULTS: As only 4 patients were found with preoperative haematocrit alteration, this variable was not included in the model. By means of the likelihood-ratio test, we also eliminated patients with history of anticoagulation and those with previously altered platelet count (n=10) because they did not present a significant modification in the model. The generation cohort included 6 variables: American Society of Anaesthesia (ASA) grade 3-4 (OR 1.52, 95%CI 1.11-2.07, p=0.008), diabetes (OR 2.33, 95%CI 1.5-3.6, p=0.001), preoperative altered potassium (OR 2, 95%CI 1.2-3.5, p=0.008), preoperative altered sodium (OR 1.8, 95%CI 1.2-2.8, p=0.005), preoperative altered glycemia (OR 3.6, 95%CI 1.4-9.4, p=0.008), preoperative altered serum creatinine (OR 8.15, 95%CI 5.6-11.8, p<0.001). The Cox calibration had a slope of 1 (95%CI 0.85-1.14) and a CITL of 0 (95%CI -0.14 to 0.14). The AUROC was 0.75 (95%CI 0.72-0.78). In the validation cohort, the calibration obtained a slope of 1 (95%CI 0.7-1.2) and a CITL of 0 (95%CI -.022 to 0.22), whereas the AUROC was 0.78 (95%CI 0.74-0.82). In order to generate the score, the lowest coefficient, ASA grade 3-4, was assigned 1 point, and thereafter 1.5 points were assigned to diabetes, 1.3 to preoperative altered potassium, 1.2 to preoperative altered sodium, 2.5 to preoperative altered glycemia, and 5.5 to preoperative altered serum creatinine. The calibration of the score had a slope of 1 (95%CI 0.85-1.14) and a CITL of 0 (95%CI -0.14 to 0.14), while the discrimination had an AUROC of 0.75 (95%CI 0.72-0.78). When applying the score to the population, 62% of the population had 1 point or less. In turn, a patient with 1 point had a sensitivity of 87% and a specificity of 37.5% to predict abnormal postoperative laboratory test, whereas a score of 1.2 had a sensitivity of 66% and a specificity of 73%.

DISCUSSION AND CONCLUSION:

The proposed model was able to predict abnormal postoperative laboratory findings in THA patients. Several variables, including high ASA score, preoperatively altered electrolytes, serum creatinine, glycemia and history of diabetes were significantly associated with the outcome. It seems appropriate to recommend a postoperative laboratory control whenever a patient has more than one point in the score (i.e., 1.2 or higher).