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Can blood tests give us any clues about the outcome in spinal surgery? forecasting recovery from preoperative hemoglobin, proteins, and immune function

2. Spine

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Aims

In the current healthcare context, with several initiatives aiming to improve the quality of care while reducing the costs, the value of routine blood tests prior to elective spinal surgery is not entirely clarified. How well can these tests reflect the patient's disease history and physical status or detect any abnormality that might influence the outcome? Are there any circulating blood markers that have relevance from the patient's point of view? This lecture will discuss the results regarding the predictive value of hemoglobin on the recovery from disability in spinal patients, anticipating the ongoing analyses on proteins and immune cells.

Methods

Patients undergoing spinal surgery were identified in the 2016-2019 institutional registry (SpineREG). Preoperative levels of C-reactive protein, erythrocytes, white cells, hematocrit, hemoglobin, thrombocytes, glucose, proteins, ions, liver and renal parameters were tested for associations with patient-reported outcome measures after surgery, which were referred to the Oswestry Disability Index (ODI), the Core Outcome Measures Index (COMI), and the SF36 physical functioning. Adjusted multivariate regressions and the multilayer perceptron (MLP) neural network were used to investigate associations and forecast predictions.

Results

A total of 1392 patients were included in the preliminary analysis studying the role of red blood cell count. There was found a positive association between the preoperative disability and the C-reactive protein ($p<0.00001$). An inverse association was observed for erythrocytes ($p<0.00001$), hematocrit ($p<0.00001$), hemoglobin ($p<0.00001$), and mean corpuscular hemoglobin concentration ($p=0.00003$). Hemoglobin was found to be the strongest biochemical predictor of recovery at 17 months (a 30% decrease or a raw reduction ≥12.7 from baseline ODI score). The neural network model including hemoglobin, years of age, anesthesia risk, baseline ODI, days of hospital stay showed a fair diagnostic performance, having an area under the curve of 0.726 and a sensitivity of 86.79%.

Conclusions

Normal values close to the threshold and abnormal preoperative laboratory testing are clearly associated with the patient's physical status prior to spinal surgery. Moreover, at the present stage of the investigation, hemoglobin resulted to be one of the key markers on which to build appropriate predictive models for long-term recovery after spine surgery. According to the data already published in the literature, the authors believe that also proteins and immune function might represent important predictors of outcome, shedding some light on the role of preoperative routine blood tests for the quality of healthcare.

Selected references

1. Briguglio M. et al. Prediction of Long-Term Recovery From Disability Using Hemoglobin-Based Models: Results From a Cohort of 1,392 Patients Undergoing Spine Surgery. Frontiers in Surgery 2022. DOI: 10.3389/fsurg.2022.850342

2. Briguglio M. and Wainwright TW. Nutritional and Physical Prehabilitation in Elective Orthopedic Surgery: Rationale and Proposal for Implementation. Ther Clin Risk Manag 2022. DOI: 10.2147/TCRM.S341953