Perioperative Complications of Pediatric Orthopaedic Surgery in Sickle Cell Disease

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INTRODUCTION: Children with sickle cell disease (SCD) undergo orthopaedic surgery at a disproportionate rate due to orthopaedic manifestations of the disease, including femoral head osteonecrosis, osteomyelitis, and physeal growth disturbances. Presurgical shared decision making must acknowledge that this population is at increased risk for significant perioperative complications, including acute chest syndrome (ACS), acute pain crises, nephropathy, or stroke. The purpose of the present study was to identify predictors of perioperative complications among children undergoing orthopaedic surgery.

METHODS: A retrospective review was conducted of children with SCD who underwent orthopaedic surgery at a pediatric tertiary care center between 2009 and 2019. Patient data, including demographics, hemoglobin genotype, preoperative laboratory values, history of prior sickle cell vasoocclusive events, and recent emergency department visits were collected. Procedure specific information was also recorded including surgical indication, anatomic site, duration, tourniquet use, estimated blood loss, implanted hardware, and postoperative weight-bearing restrictions. The primary study outcome was postoperative complications within 30 days requiring an emergency department (ED) visit or hospital admission. Patient characteristics and procedure specific data were analyzed for their association with postoperative complications using univariate and multivariate regression analyses.

RESULTS:

Ninety-two patients who underwent 118 orthopaedic procedures were identified. The average age at surgery was 12.0 years (SD 4.8 years) with a slight male predominance (54% male). The most common hemoglobin genotypes were SS (74%) and SC (13%) and S-Beta thalassemia (7%). Most cases were elective (n=82, 70%) and nearly all included preoperative admissions (n=110, 93%) for optimization with intravenous fluids. About half of patients received a preoperative transfusion (n=60, 51%). Mean procedure length was 71 minutes (SD 59), 22% of cases used a tourniquet, and 43% of cases had protected weight-bearing postoperatively. The lower extremity was the most frequent surgical site (n=86, 73%). There was a plurality of cases about the hip (n=54, 46%) including 28 core decompressions (24%), 9 total hip arthroplasties (8%), 7 irrigation and debridement procedures for infection (6%), 5 varus derotational osteotomies (4%), 3 open removals of hardware (3%), 1 hip open reduction, and 1 hip arthroscopy. The mean length of inpatient stay was 5.8 days (SD 9).

There were 19 postoperative complications (16%) that required ED visit or hospital readmission within 30 days including 7 cases (6%) of ACS, 9 cases (8%) with pain crises, 1 case of priapism, 1 fever of unknown origin, and 1 recurrent infection requiring surgical management.

There were significantly more complications following surgery about the hip as compared to other sites (24% vs. 9%, p=0.04). In multivariate analysis, hip surgery was associated with an odds ratio (OR) of 5.83 of postoperative complications (p=0.03, 95% CI 1.24 to 27.4) after controlling for age, sex, hemoglobin genotype, history of ACS, preoperative hemoglobin levels, preoperative transfusion, implanted hardware, duration of procedure, estimated blood loss, and protected weight-bearing postoperatively.

The number of ED visits in the past year was also associated with postoperative complications (p<0.01). In univariate analysis, four or more ED visits in the past year were associated with an OR of 5.8 for postoperative complication (p=0.001, 95% CI 2.05 to 16.4). In multivariate analysis four or more ED visits were associated with an OR of 5.7 for postop complication (p=0.01, 95% CI 1.6 to 20.5) after controlling for age, sex, operative site, hemoglobin genotype, history of ACS, preoperative hemoglobin levels, preoperative transfusion, implanted hardware, duration of procedure, tourniquet use, estimated blood loss, and protected weight-bearing postoperatively.

DISCUSSION AND CONCLUSION: Children with SCD are at increased risk for complications after orthopaedic surgery, including ACS and other vasoocclusive crises. Surgery about the hip and multiple prior ED visits in the past year were found to be independent predictors of postoperative complications. These associations persisted despite controlling for a broad range of patient and procedure specific factors. These higher risk patients should be identified preoperatively, comanaged by the hematology service, and closely monitored postoperatively for the development of ACS or vasoocclusive crises.