Neoplastic Pathologic Fractures are Associated with a Higher Risk of Postoperative Bleeding and Thromboembolic Events – A National Surgical Quality Improvement Program Database Study of 132,923 Patients

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INTRODUCTION:
Although surgical treatment has improved functional outcomes and survival rates of patients with hip fractures, management of this condition poses significant risks of postoperative complications. Compared to native hip fractures, pathologic fractures (PF) carry a higher risk of both thromboembolic (TE) events and postoperative bleeding. However, pathologic fractures represent a very heterogeneous group and most studies do not differentiate between etiology (neoplastic and non-neoplastic PF). Our study sought to answer the following questions: 1) Are neoplastic PF of the hip associated with worse 30-day postoperative outcomes than native hip fractures? 2) Are neoplastic PF of the hip associated with worse 30-day postoperative outcomes than non-neoplastic PF?

METHODS:
Data was retrospectively collected from the National Surgical Quality Improvement Program (NSQIP), a nationwide database run by the American College of Surgeons (ACS). We identified patients with native and pathologic hip fractures using the ICD diagnosis codes. ICD-10 codes were required for identification of pathologic hip fractures caused by neoplastic disease. CPT codes for treatment of hip fractures through hemiarthroplasty, total hip arthroplasty (THA), intramedullary nailing, or plate and/or screw fixation were utilized. Outcomes assessed included 30-day mortality, unplanned readmission, reoperation related to first event (hip fracture), and postoperative complications within 30 days of index surgery. A Propensity-Score Match (PSM) analysis was conducted between patients with native hip fractures and those with neoplastic PF. Patients were matched based on variables that were found to be significant ($p<0.05$) on bivariate analysis; this led to a final 6-to-1 matching process. A similar analysis was performed to compare patients with non-neoplastic pathologic hip fractures with those with neoplastic pathologic hip fractures. Comparison of continuous variables between groups was done through the Mann-Whitney U test; for categorical variables, we used the Chi-square test. A p value <0.05 was considered statistically significant.

RESULTS: A total of 127,819 patients with hip fractures and 5,104 with PF diagnosed from 2005 to 2021 were retrieved from the NSQIP database (Figure 1). We included 1,843 patients with neoplastic PF and 3,261 with non-neoplastic PF. After PSM, 6,133 patients with native hip fractures and 1,263 patients with neoplastic PF were finally included (Table 1). Compared with native hip fractures, patients with neoplastic PF had a higher rate of thromboembolic events, including deep venous thrombosis (DVT) (4% vs. 1.2%, p=0.001) and pulmonary embolism (PE) (2.4% vs. 0.7%, p<0.001) (Table 2). Likewise, rates of postoperative bleeding were higher in patients with neoplastic PF (29.3% vs. 23.9%, p<0.001). Unplanned readmission within 30 days was almost twice as high in the neoplastic PF group (16.1% vs. 8.8%, p<0.001). Thirty-day mortality was higher in the neoplastic pathologic hip fracture group. We subsequently compared 30-day postoperative outcomes between neoplastic and non-neoplastic PF groups (Table 3). PE rates were 2.5 times higher in the neoplastic PF group (2.5% vs. 1.0%, p=0.015) (Table 4). Likewise, postoperative bleeding was higher in the neoplastic pathologic hip fracture group (27.6% vs. 22.0%, p=0.009). Patients with neoplastic PF had a higher unplanned readmission rate (13.8% vs. 9.6%, p=0.008) and 30-day mortality rate (8.1% vs. 4.2%, p<0.001) than those with non-neoplastic PF.

DISCUSSION AND CONCLUSION: Management of neoplastic pathologic hip fractures is highly challenging due to an increased risk of both postoperative thromboembolic and bleeding events. Furthermore, our study demonstrated that the etiology of the pathologic fracture does also affect postoperative complication rates and patients with neoplastic pathologic fractures display worse outcomes. Future studies should focus on determining the optimum anticoagulation regimen for this patient population in order to diminish the thromboembolic risk without increasing the rates of postoperative bleeding.