Greater than 24-Hour Wait to Surgery in Geriatric Hip Fracture Patients Taking Factor Xa Inhibitors is Associated with Lower Hemoglobin Levels and Increased Length of Stay without Decreasing Transfusion Risk

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INTRODUCTION: Geriatric patients who sustain hip fractures are recommended to undergo surgery as soon as medically optimized. Patients who take factor Xa inhibitors experience delayed time to surgery. The purpose of this study was to compare outcomes of hip fracture patients taking factor Xa inhibitors who underwent surgery ≤ 24 hours from admission with outcomes of patients who underwent surgery > 24 hours and ≤ 72 hours from admission.

METHODS:

This was a retrospective study at a single level 1 trauma center. We reviewed patients aged 65 and older who were taking factor Xa inhibitors and underwent hip fracture surgery from 2014 to 2022. We excluded patients who were transferred from outside institutions or presented with other active medical conditions. The Expedited group consisted of patients who underwent surgery ≤ 24 hours from admission. The Delayed group consisted of patients who underwent surgery > 24 hours and ≤ 72 hours from admission. We excluded times > 72 hours since these patients likely required additional optimization beyond the expected delay for taking factor Xa inhibitors. We recorded admission Hgb, lowest preoperative Hgb, and lowest postoperative Hgb (within the first four postoperative days). Preoperative blood loss equaled admission minus lowest preoperative Hgb. Overall blood loss equaled admission minus lowest postoperative Hgb. Primary outcomes were transfusion rates, preoperative blood loss, and overall blood loss. Transfusion thresholds were at the discretion of the patient's internist or anesthesiologist. Secondary outcomes were length of stay and 90-day complication rates. Since factor Xa inhibitors are renally cleared, we evaluated whether renal function (as measured by creatinine clearance, or CrCl) was correlated with time to surgery and transfusion rates.

RESULTS:

We identified 185 hip fracture patients taking factor Xa inhibitors. The Expedited group consisted of 41 patients, and the Delayed group consisted of 133 patients. Eleven patients underwent surgery greater than 72 hours from admission and were excluded. There were no differences in demographics, perioperative characteristics, medical comorbidities, or renal function (Table 1). There were no differences in transfusion rates (Table 2). The Delayed group trended toward increased preoperative blood loss ($p = 0.055$) and increased overall blood loss ($p = 0.270$). The admission Hgb, lowest preoperative Hgb, and lowest postoperative Hgb were significantly lower in the Delayed group ($p = 0.027$, $p = 0.001$, and $p = 0.020$, respectively). Length of stay was significantly longer in the Delayed group ($p = 0.001$). There were no differences in 90-day readmission, reoperation, mortality, or complications. Renal function was inversely correlated with time to surgery ($r = -0.18$, $p = 0.017$). Decreased renal function was associated with a higher preoperative transfusion rate ($p = 0.014$) but not overall transfusion rate (Table 3).

DISCUSSION AND CONCLUSION: For geriatric hip fracture patients taking factor Xa inhibitors, surgery greater than 24 hours from admission was associated with lower hemoglobin levels and increased length of stay without decreasing transfusion risk. Delayed surgery also trended toward increased preoperative and overall blood loss. Decreased renal function correlated with longer times to surgery and was associated with a higher preoperative transfusion rate. Patients taking Factor Xa inhibitors who are otherwise medically optimized may benefit from surgery within 24 hours.

Table 1: Demographics, Preoperative, and Perioperative Characteristics

Characteristic	Expedited (n = 41)	Delayed (n = 133)	P-value
Age (years)	85.5 ± 6.4	84.0 ± 7.7	0.160
Gender (% female, n)	56.1% (23)	66.9% (89)	**0.026**
Type of DOAC (%, n)			**0.028**
Apixaban	48.8% (20)	67.7% (90)	
Rivaroxaban	51.2% (21)	32.3% (43)	
ASA classification (%, n)			1.000
II	12.2% (5)	11.3% (15)	
III	78.0% (32)	76.7% (102)	
IV	9.8% (4)	12.0% (16)	
Age-adjusted Charlson Comorbidity Index	6.2 ± 2.6	6.0 ± 2.5	0.660
Preoperative renal function (%, n)			0.198
Normal (CrCl ≥ 50)	78.0% (32)	70.7% (94)	
Decreased (30 ≤ CrCl < 50)	19.5% (8)	17.3% (23)	
Severely decreased (CrCl < 30)	2.4% (1)	12.0% (16)	
Fracture type (%, n)			0.595
Femoral neck	53.7% (22)	48.1% (64)	
Intertrochanteric	43.9% (18)	50.4% (67)	
Subtrochanteric	2.4% (1)	1.5% (2)	
Implant type (%, n)			0.082
Arthroplasty	34.1% (14)	38.3% (51)	
Cephalomedullary nailing	48.8% (20)	48.1% (64)	
Sliding hip screw	2.4% (1)	3.8% (5)	
Percutaneous screw fixation	14.6% (6)	9.8% (13)	
Primary anesthesia type (%, n)			0.201
General	87.8% (36)	73.7% (98)	
Neuraxial	4.9% (2)	13.5% (18)	
Regional	7.9% (3)	12.8% (17)	

Table 2: Hemoglobin Results, Transfusion, and Postoperative Outcomes

Characteristic	Expedited (n = 41)	Delayed (n = 133)	P-value
Admission Hgb (g/dL)	12.7 ± 1.9	11.9 ± 1.9	**0.027**
Lowest preoperative Hgb (g/dL)	11.9 ± 1.9	10.7 ± 2.1	**0.001**
Preoperative blood loss (g/dL)	0.8 ± 0.8	1.2 ± 1.3	0.055
Lowest postoperative Hgb (g/dL)	9.7 ± 2.3	8.7 ± 1.7	**0.020**
Overall blood loss (g/dL)	3.1 ± 1.6	3.2 ± 1.6	0.500
Transfusion rate, overall	26.8% (11)	33.1% (44)	0.451
Length of stay (days)	5.5 ± 2.6	7.0 ± 3.1	0.001
90-day readmission	22.0% (9)	24.1% (32)	0.781
90-day reoperation	2.4% (1)	3.0% (4)	1.000
90-day mortality	4.9% (2)	6.0% (8)	1.000
90-day complication			
Cerebrovascular accident	4.9% (2)	1.5% (2)	0.236
Myocardial infarction	4.9% (2)	1.5% (2)	0.236
Deep venous thrombosis or pulmonary embolism	4.9% (2)	0% (0)	0.054
Gastrointestinal bleed	2.4% (1)	1.5% (2)	0.556
Significant drainage / infection	2.4% (1)	1.5% (2)	0.558

Table 3: Transfusion Relative to Renal Function

Transfusion period	Preoperative renal function			P-value
	Normal (n = 126)	Decreased (n = 31)	Severely decreased (n = 17)	
Preoperative	2.4% (3)	9.7% (3)	17.6% (3)	**0.014**
Intraoperative	0.8% (1)	3.2% (1)	5.9% (1)	0.185
Postoperative	29.4% (37)	32.3% (10)	29.4% (5)	0.962