Novel Oral Anticoagulants in Patients Undergoing Cranial Surgery

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Introduction

Despite growing clinical relevance, due to the increasing number of neurosurgical patients treated with novel oral anticoagulants (NOACS), guidelines on the perioperative management of these patients are still lacking. The aim of this study was to analyze the occurrence of postoperative bleeding events and factors which might influence bleeding rates of these patients.

Methods

Out of 1353 consecutive patients undergoing cranial neurosurgical procedures 30 patients (2.2%) were under NOACS preoperatively. In addition to the descriptive review of these patients, the rate of peri- and postoperative intracranial bleeding events, postoperative thromboembolic events, hematologic findings, morbidity, and mortality were reviewed. A sub-analysis of factors influencing the bleeding risk of these patients and the bleeding rate depending on the preoperative discontinuation time of NOACS, with a cutoff of 24 and 48 hours, was additionally completed.

Baseline Characteristics (n=30)

Sex (female) n (%)	13 (43.3)		
Age (y) (mean ± SD)	69.8 ± 15.9		
Indication for NOAC n (%)			
Atrial fibrillation	18 (60)		
TIA/CVI	6 (20)		
Pulmonary embolism	1 (3.3)		
Deep Vein Thrombosis	4 (13.3)		
DIC	1 (3.3)		
Type of cranial surgery n (%)		**Discontinuation time of NOAC mean (±SD)**	**p-value**
Trauma	14 (46.7)	5.1 (±8.1)	0.09
Tumor	11 (36.7)	15.9 (±34.6)	0.03
Other	5 (16.6)	9.2 (±12.4)	0.24

TIA: Transient ischemic attack; CVI: Cerebrovascular Insult; AF: Atrial fibrillation; DIC: Dissemitated Intravascular Coagulation; CAD: Coronary Artery Disease; CABG: Coronary Artery Bypass Graft; DM: Diabetes Mellitus

Results

The rate of perioperative bleeding was 13.3% (n=4), leading to the death of two patients. The mean discontinuation time was significantly shorter in the patients experiencing a bleeding event compared to those without (1.5 days (range 0 to 3 days) vs. 11 days (range 0 to 120 days), respectively). The rate of perioperative thromboembolic events was 3.3% (n=1), and overall mortality rate was 13.3% (n=4).

Primary and Secondary Outcomes Measurements (n=30)

Outcome measurement	**Total (n=30)**
Overall bleeding events n(%)	4 (13.3)
Thromboembolic complications n(%)	1 (3.3)
Morbidity	
Systemic and infectious complications n(%)	4 (20)
Surgical site infections n (%)	0 (0)
Morbidity without bleeding events n (%)	5 (16.6)
Overall morbidity n (%)	9 (30)
Mortality n(%)	4 (13.3)
Operation time (min) (mean ± SD)	142.3 ± 94. 6
Hospitalization time (d) (mean ± SD)	13.3 ± 9.9
Postop. clinical condition n(%)	
better	13 (43.3)
same	13 (43.3)
worse	4 (13.3)

Conclusions

The postoperative bleeding rate in patients undergoing cranial surgery treated with NOACS in our cohort was 13,3%, while shorter preoperative discontinuation time seems to affect bleeding rates significantly. Further studies evaluating the management and postsurgical outcome of these patients are warranted.

Univariate Analysis of factors influencing bleeding rates in patients with NOACS

	No bleed (n=26)	**Bleed (n=4)**	**p-Value**
Age (n ± SD)	68.7 ± 16.4	80.0 ± 7.9	0.19
Sex female n (%)	12 (46)	1 (25)	0.61
Type of Surgery (n)			0.79
Trauma	13	3	
Tumor	10	1	
Vascular	2	0	
Shunt	1	0	
Underlying medical condition (n)			
Hypertension	15	3	0.63
CAD	14	3	0.61
Coronary stent	2	0	1.00
CABG	1	1	0.25
DM	5	1	1.00
TIA	7	2	0.56
Carotid stenosis	0	0	0.45
AF	16	3	1.00
OR time (min)	152.7 ± 95.2	75 ± 25.9	0.11
Discontinuation of NOACS (days ± SD)	11 ± 23.1	1.5 ± 1.7	0.04
Resumption of NOACS (days ± SD)	15 ± 10.3	8 ± 4.2	0.92

Analysis of preoperative and discontinuation time influencing bleeding rates in patients with NOACS

	No bleed (n=26)	**Bleed (n=4)**	**p-Value**
Preoperative discontinuation time cut off of 24 hours			0.039
≤ 24 hours n (%)	1 (33.3%)	2 (66.7%)	
> 24 hours n (%)	25 (92.6%)	2 (7.4%)	
Preoperative discontinuation time 0 - 48 hours with cut off of 24 hours			0.99
≤ 24 hours n (%)	4 (66.6%)	2 (33.3%)	
24 - 48 hours n (%)	2 (100%)	0 (0%)	
Preoperative discontinuation time cut off of 48 hours			0.28
≤ 48 hours n (%)	6 (75%)	2 (25%)	
> 48 hours n (%)	20 (90.9%)	2 (9.1%)	
Resumption of NOACS			0.22
≤ 14 days	5 (71.4%)	2 (28.6%)	
> 14 days	21 (91.3%)	2 (8.7%)	