

Contemporary Anticoagulation Practices for Postoperative Atrial Fibrillation: A Single Center Experience

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Abstract

Aims: Postoperative atrial fibrillation (POAF) is a frequent in-hospital complication after cardiac surgery. Surprisingly, despite its prevalence, management of this condition has not been well studied. One promising approach that has been evaluated in a limited number of studies is use of anticoagulation. However, the trends and patterns of real-world use of anticoagulation in POAF patients has not been systemically investigated. In this study, we aimed to determine real-world patterns of anticoagulation use for patients with POAF.

Methods: We identified 200 patients undergoing coronary artery bypass (CABG) or cardiac valve surgery at University Hospitals Cleveland Medical Center over a 2 year period beginning January 2016 with new onset POAF. We reviewed charts to verify candidacy for inclusion in the study and to extract data on anticoagulation use, adverse outcomes, and CHA₂DS₂-VASc scores.

Results: Anticoagulation use was low after CABG, but high after bioprosthetic valve surgery. The most common anticoagulant used was warfarin. Anticoagulation use was not correlated with CHA₂DS₂-VASc score or cardioversion. Stroke and mortality were higher among patients not receiving anticoagulation, however, confirmation of this finding in larger randomized studies is warranted.

Conclusion: Anticoagulation use is low after CABG and this practice does not appear to be affected by CHA₂DS₂-VASc score or cardioversion. This differs with previously reported provider attitudes towards management of this condition. Stroke and mortality appear to be elevated for patients not receiving anticoagulation but further investigation is required to confirm this observation.

Introduction

Postoperative atrial fibrillation (POAF) is a common in-hospital complication after cardiac surgery, affecting between 30-50% of patients undergoing the procedure, and is often managed by surgeons, internists, cardiologists, and critical care physicians or nurse practitioners.^{1,2} Although this complication is commonly believed to be self-limited, multiple studies have demonstrated high rates of late recurrence of atrial fibrillation (AF) in these patients.³⁻⁵ Importantly, POAF has repeatedly been associated with a higher incidence of mortality and multiple comorbidities, including stroke, heart attack, heart failure, and increased length of hospital stay.⁶⁻¹¹ Nevertheless, there is no consensus on the optimal short or long term management of this condition. Studies have shown promise for anticoagulation, as it has been associated with a reduced incidence of stroke and all-cause mortality.¹² These findings have not been consistently adopted into international guidelines, partly because of the lack of high quality randomized data, but likely also in part due to the general lack of

information on this topic.¹³⁻¹⁸ Furthermore, it has been previously shown that attitudes towards management of this condition vary substantially between providers.¹⁹ In this study, we evaluate the real-world use of anticoagulation in a POAF cohort, specifically assessing the impact of cardioversion and the CHA₂DS₂-VASc score on use of anticoagulation, two important considerations in management of stroke prevention therapy.

Methods

Study Population

We included patients over 18 years of age who had undergone either coronary artery by pass (CABG) surgery or valve surgery (bioprosthetic valve in any position) and had a diagnosis of POAF. Patients with a pre-existing diagnosis of AF or a mechanical heart valve were excluded. We queried our internal cardiothoracic department surgery data base at University Hospitals Cleveland Medical Center to identify patients meeting these criteria between January 2016 and April 2017. These records were then manually reviewed to verify inclusion and exclusion criteria as noted above. Charts that met our criteria were then manually reviewed to extract remaining relevant data, including type of surgery, anticoagulant use and timing, chemical or electrical cardioversion, complications including death, stroke, or transient ischemic attack (TIA), risk factors including CHA₂DS₂-VASc score, and use of cardiac

Key Words

Postoperative Atrial Fibrillation, Anticoagulation, Cardiac Surgery

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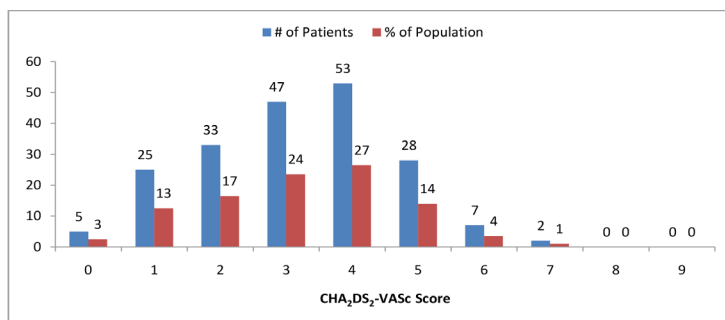


Figure 1: Distribution of CHA₂DS₂-VASc scores among patients undergoing cardiac surgery.

monitoring on discharge. Prescription of anticoagulation before discharge with no alternative indication for anticoagulation use was taken to mean anticoagulation for the indication of newly diagnosed POAF.

Outcomes

The primary outcomes of interest were the rates of anticoagulation use stratified by the type of cardiac surgery, CHA₂DS₂-VASc score, and the need for cardioversion. Additionally, we assessed the impact of anticoagulation on ischemic stroke and all-cause mortality at 30 days and one year after surgery. The follow up time accrued was from the date of surgery until the one year of follow up or death, whichever came first.

Statistical Methods

For rates of anticoagulation use, we excluded patients with contraindications or alternative indications for anticoagulation use. The proportion of POAF patients receiving anticoagulation was calculated for the remaining population, as well as in subgroups by type of surgery, CHA₂DS₂-VASc score, and cardioversion status. Additionally, the unadjusted incidence of stroke and mortality was

calculated in the overall population, and in subgroups stratified by the use of anticoagulation. Stroke or TIA occurring on the day of surgery was considered procedure related, and excluded from analysis. All data analyses were performed using Microsoft Excel. Statistical analysis was performed using Chi-squared analysis. An alpha level of 0.05 was used for statistical significance. This study was approved by our institutional review board, and was found to be exempt from the need for informed consent.

Results

Cohort Characteristics

We included 200 eligible patients for the final analyses. Of these, 161 (81%) had CABG alone, and 39 (20%) had valve surgery either alone or in addition to CABG. The average patient age was 68 ± 12 years, and 39% of the patients were female. The average CHA₂DS₂-VASc score was 3.3 ± 1.5 , with 47% of patients having a CHA₂DS₂-VASc score of 4 or greater. The distribution of CHA₂DS₂-VASc score in the overall population is outlined in Figure 1. Other demographic information can be found in Table 1.

Anticoagulation Use

Twenty three of 200 patients had a contraindication or alternative indication for anticoagulation, including mechanical valves, and were excluded. Overall, 81 of 177 patients (46%) received some form of anticoagulation, of which 80 (99%) received warfarin. For patients with valve surgery, 31 of 32 patients (97%) received anticoagulation compared to 50 of 145 patients (34%) with CABG alone. However, 55% of patients with bioprosthetic valve surgery or repair received anticoagulation before the diagnosis of AF was made. Anticoagulation use did not differ by CHA₂DS₂-VASc score (Figure 2; $\chi^2(7, 177) = 6.9, p = .44$).

Table 1: Population Demographics

	% of Population
Age	
- <40	2.5%
- 40-50	4%
- 50-60	15.5%
- 60-70	31.5%
- 70-80	33.5%
- >80	13%
Gender	
- Male	61%
- Female	39%
Hypertension	82.5%
Ejection Fraction	
- <20%	3.5%
- 20-35%	18.5%
- 35-50%	16%
- >50%	62%
Diabetes	39%
Prior Stroke	10.5%
Peripheral Vascular Disease	16%
Creatinine Clearance	
- >60	75%
- 30-60	20%
- <30	5%
Operation	
- CABG	81%
- Valve	20%
Cardioversion	48.5%
- Chemical	42.5%
- Electrical	6%

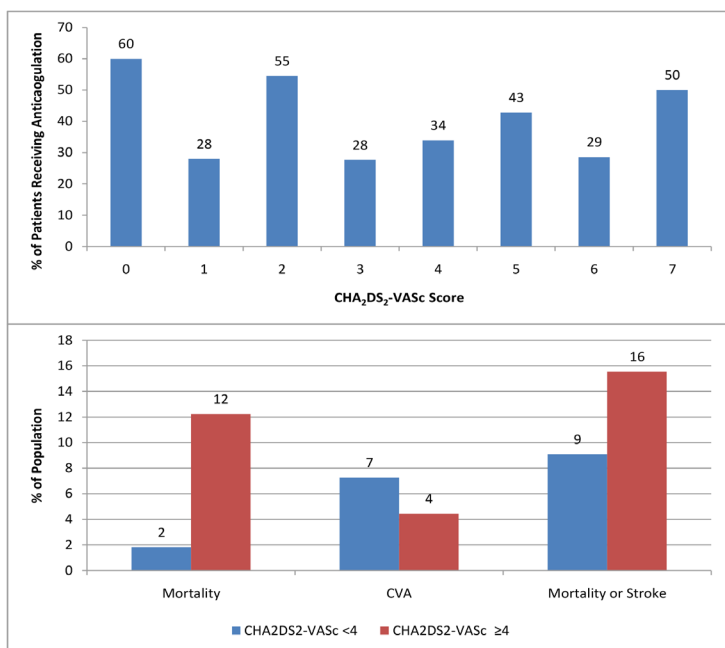


Figure 2: Top: Percent of patients receiving anticoagulation by CHA₂DS₂-VASc score. Bottom: Percent of patients with complications by CHA₂DS₂-VASc score.

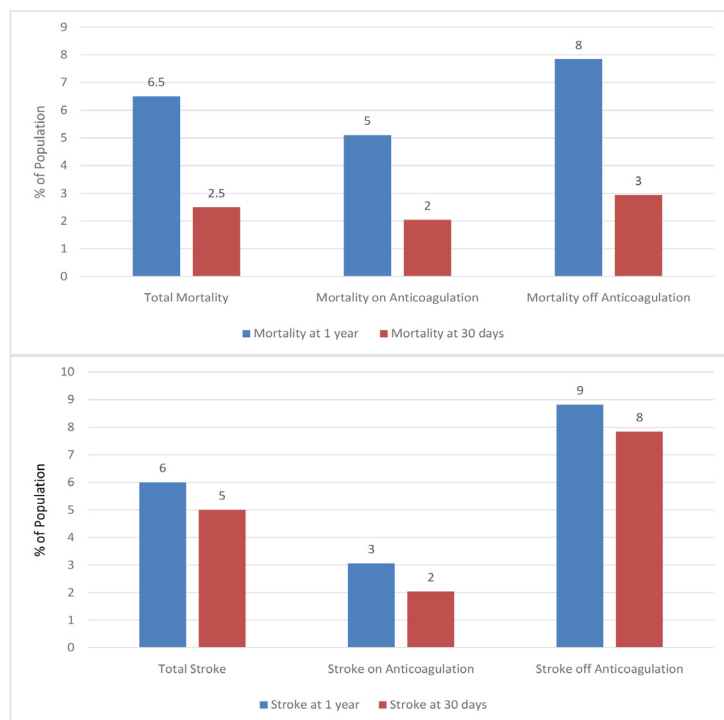


Figure 3:

Top: Percent of patients with mortality at 30 days and 1 year by anticoagulation status. Bottom: Percent of patients with stroke or transient ischemic attack at 30 days and 1 year by anticoagulation status.

This finding remains after sensitivity analysis by excluding patients with valve surgery ($\chi^2(7, 145) = 5.9, p = .56$). Overall, anticoagulation use after chemical cardioversion was 47% and after electrical cardioversion was 63%. After removing patients with anticoagulation prior to AF diagnosis, these numbers drop to 43% and 57% respectively, and after removing all valve operations, they drop further to 37% and 50%, respectively. There was no statistically significant correlation between cardioversion and anticoagulation use among any of these groups. Of note, only one patient was discharged with cardiac monitoring (0.6%). This patient also received anticoagulation with warfarin prior to discharge.

Outcomes

The overall mortality rate in our cohort at 30 days and 1 year of follow up was 2.5% and 6.5%, respectively. Overall, 5.5% of patients suffered a stroke or TIA within 1 year of follow up, and 3.5% had a stroke or TIA within 30 days of surgery. Mortality was higher in the cohort with higher CHA₂DS₂-VASc scores (≥ 4), but no significant difference was observed for stroke or TIA (Figure 2; $\chi^2(1, 200) = 11.5, p < .001$ and $\chi^2(1, 200) = .53, p = .47$ respectively). Mortality and stroke or TIA were observed more frequently among patients not receiving anticoagulation compared with those who did (7.8% vs 5.1% and 7.8% vs 3.1% at one year respectively; Figure 3). These findings were not statistically significant ($\chi^2(1, 200) = .56, p = .45$ and $\chi^2(1, 200) = 2.1, p = .15$ respectively). There was again no difference on sensitivity analysis after excluding patients with valve surgery ($\chi^2(1, 200) = .009, p = .96$ and $\chi^2(1, 200) = 1.6, p = .24$ respectively). There was similarly no significant difference in mortality or stroke or TIA at 30 days in either the total cohort or CABG subgroup.

Discussion

Anticoagulation Use in POAF

Our primary objective was to evaluate the use of anticoagulation in a real-world cohort of POAF patients. We noted that overall, anticoagulation use was low in our patient cohort. This is not surprising given the lack of a robust evidence base and the conflicting recommendations from international guidelines.¹³⁻¹⁸ However, our data demonstrate a higher rate of anticoagulation than in previous reports, even when limited to patients undergoing CABG alone.¹²

Role of CHA₂DS₂-VASc Score & Cardioversion

Interestingly, we found that the use of anticoagulation did not significantly increase in those who underwent a rhythm control strategy, including electrical cardioversion, although this may have been due to the small sample size in the latter group. Nonetheless, this suggests that care givers were less likely to view such interventions as an independent indication for anticoagulation. We also found no correlation between CHA₂DS₂-VASc score and anticoagulation use, signifying that this was not part of the decision algorithm among the majority of care givers. We suspect this is due to the lack of uniformity in guidelines specifically recommending this score for risk stratification in the POAF population. Alternatively, anticoagulation use may have been driven by concern for postoperative bleeding. We also saw a strikingly low rate of direct oral anticoagulant use compared with warfarin. These factors may be attributable to differences in surgeon preference at our institution.

A recent nationwide survey of provider attitudes found that there was substantial variation in practice patterns regarding management of POAF, further corroborating our findings that management of this disease process is inconsistent.¹⁹ Interestingly, however, most providers in this survey reported using the CHA₂DS₂-VASc score for risk stratification as well as anticoagulation use after cardioversion. This stands in contrast to our findings that neither of these factors correlated with anticoagulation use. It is unclear if these differences were due to ideological differences between cardiologists (making up the majority of survey respondents) and cardiothoracic surgeons or critical care physicians (making up the majority of providers managing POAF at our institution) or if these differences reflect real world barriers for ideal management of this disease.

Role of Surgical Intervention

The frequency of anticoagulation use in patients with valve surgery was expectedly high given the guideline recommendation for routine short-term anticoagulation after bioprosthetic valve replacement, even in the absence of AF.^{20,21} In our experience, this practice is care giver dependent. However, the high proportion of patients receiving anticoagulation before the diagnosis of AF in this cohort suggests that this may have been a predominant reason for anticoagulation in these patients at our institution. Sensitivity analysis demonstrated that CHA₂DS₂-VASc was not a driving factor for anticoagulation prescription, even after removing these patients.

Outcomes

This study was not powered to distinguish differences in outcomes by anticoagulation status or other risk factors, however, we report

this data to provide comparison with other published reports and add to the small body of work reporting such outcomes. Our data demonstrate a trend towards less stroke and mortality among patients receiving anticoagulation. This is consistent with previous reports that anticoagulation is associated with fewer complications in patients with POAF.¹² Interestingly, we did not see a clear trend towards a higher incidence of stroke among patients with higher CHA₂DS₂-VASc scores, although an increase in mortality was observed. To our knowledge, only one larger study reports outcomes in POAF by anticoagulation status with approximately 600 patients included.¹² This study reported a 22% relative risk reduction in mortality, similar to our findings. Nonetheless, other studies have shown no benefit of anticoagulation leaving the intervention in need of further study.²² Our findings push the balance further in favor of anticoagulation.

Limitations

This study had several limitations, including the single center and retrospective nature of the study. These findings may not be generalizable to other institutions that may have different policies or culture with respect to anticoagulation use. Furthermore, we make assumptions regarding the goal of anticoagulation through evaluation of alternative indications and timing of medication prescription. This may not capture anticoagulation that was started after discharge or missed contraindications due to poor documentation. Finally, the small sample size does not allow for adequate power to determine significant differences in the outcomes of stroke or mortality, although this was not the primary purpose of this study.

Conclusion

This study confirms the overall low use of anticoagulation previously reported in the limited literature on POAF management. We also show that cardioversion and the CHA₂DS₂-VASc score do not seem to have a significant effect on the frequency of anticoagulation use, suggesting that POAF is thought of as a distinct entity from non-postoperative AF. Nevertheless, there is observational evidence to suggest a trend towards improved outcomes among those receiving anticoagulation, which is corroborated by our study. Furthermore, we identify discrepancies between provider attitudes towards treatment of POAF and real world management. These findings highlight the need for further randomized evidence to evaluate the role of anticoagulation in reducing stroke and mortality in this distinct condition, specifically among those in high risk groups such as those with a high CHA₂DS₂-VASc score or those requiring cardioversion.

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