Preoperative Atrial Fibrillation and Coronary Artery Bypass Grafting Outcomes

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ABSTRACT

Introduction: Traditionally, atrial fibrillation is considered a comorbid factor for coronary artery bypass surgery as well as other surgeries, however, current literature is still limited. In this study, the effects of preoperative atrial fibrillation on coronary artery bypass grafting were investigated.

Patients and Methods: Following the hospital's clinical trials ethics committee approval, data from 151 patients who underwent isolated coronary artery bypass surgery were collected with the assistance of the hospital's electronic records system. The follow-up duration was 12 months. Statistically significant P value cut-off taken as 0.05.

Results: The mean age was 61.5 and 26.6% (n= 40) of the patients were female. Preoperative atrial fibrillation (Afib) prevalence was 13.3% (n= 20). No significant differences were observed in patient demographics, metabolic, systemic, and cardiovascular conditions between the group with preoperative atrial fibrillation and the control group (p> 0.05). However, the previous myocardial infarction rate was found higher (38.9 vs. 70.0, p= 0.009), and carotid artery stenosis disease prevalence was found lower (18.2 vs. 0.0, p= 0.038), also mean glomerular filtration rate (GFR) was found lower (85.9 vs. 69.7, p= 0.002) in the patients with Afib. Intraoperative parameters were not statistically different among the group (p> 0.05). Despite the preoperative dysthymia history, myocardial infarction prevalence, and poor kidney function; there was no difference in terms of postoperative acute kidney injury rates, stroke rates, perioperative complication rates, and thirty-day and 12-month survival (p> 0.05). However, the re-revascularization requirement was higher in patients in the Afib group.

Conclusion: Atrial fibrillation is a prevalent comorbidity in coronary artery bypass grafting patients. However, it was not found as a factor that related to mortality or morbidity and coronary surgery seems feasible in this patient group.

Key Words: Atrial fibrillation; coronary artery bypass; ischemic heart disease

Preoperatif Mevcut Atriyal Fibrilasyon ve Koroner Arter Bypass Greftleme Sonuçları

ÖZET

Giriş: Geleneksel olarak atriyal fibrilasyon, koroner arter baypas cerrahisi ve diğer kardiyak cerrahiler için komorbid bir faktör olarak kabul edilir, ancak mevcut literatür hala sınırlıdır. Bu çalışmada, koroner arter baypas greftlemesinde ameliyat öncesi var olan atriyal fibrilasyonun etkileri araştırılmıştır.

Hastalar ve Yöntem: Hastane klinik araştırmaları etik kurul onayı alındıktan sonra hastane elektronik kayıt sistemi yardımıyla izole koroner arter baypas ameliyatı yapılan 151 hastanın verileri toplandı. Takip süresi 12 aydı. İstatistiksel olarak anlamlı P değeri kesim değeri 0.05 olarak belirlendi.

Bulgular: Çalışma kohortunun yaş ortalaması 61,5 bulundu ve hastaların toplamda %26.6'sı (n= 40) kadındı. Ameliyat öncesi var olan atriyal fibrilasyon (Afib) prevalansı %13.3 (n= 20) bulundu. Ameliyat öncesi atriyal fibrilasyonu olan hastalar ile kontrol grubu arasında hasta demografik özellikleri, metabolik, sistemik ve kardiyovasküler komorbiditeler açısından fark bulunmadı (p> 0.05). Ancak geçirilmiş miyokard enfarktüsü oranı daha yüksek (38.9'a karşı 70.0, p= 0.009) ve karotis arter stenoz hastalığı prevalansı daha düşük bulundu (18.2'ye karşı 0.0, p= 0.038), ayrıca Afib'li hastalarda GFR (glomerular filtration rate) daha düşük bulundu (85.9'a karşı 69.7, p= 0.002). İntraoperatif parametreler grup arasında istatistiksel olarak farklı değildi (p> 0.05). Preoperatif distimi öyküsü, miyokard enfarktüsü prevalansı ve zayıf böbrek fonksiyonlarına rağmen, postoperatif akut böbrek hasarı oranları, inme oranları, perioperatif komplikasyon oranları ve otuz günlük ve 12 aylık sağkalım açısından fark yoktu (p> 0.05). Ancak Afib grubu olan hastalarda revaskülarizasyon gereksinimi daha yüksekti.

Sonuç: Atriyal fibrilasyon, koroner arter baypas greftleme hastalarında yaygın bir komorbiditedir. Ancak bu hasta grubunda mortalite veya morbidite ile ilişkili bir faktör olarak bulunmamıştır ve koroner cerrahi bu hastalar için uygulanabilir görünmektedir. Çalışmamızın sonuçlarının daha büyük vaka serili çok merkezli çalışmalar ile doğrulanması elzemdir.

Anahtar Kelimeler: Atriyal fibrilasyon; koroner arter bypass; iskemik kalp hastalığı

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INTRODUCTION

Atrial fibrillation (Afib) is the most common form of dysrhythmia, affecting more than five million patients in the United States alone[1]. The frequency of Afib is quite high in patients with ischemic heart disease as a result of the disruption of the electrical conduction system of the heart due to injury due to myocardial ischemia[1].

The incidence of atrial fibrillation (Afib) in patients undergoing coronary surgery ranges from 6.1% to 15.8%, with an average of 10%. The impact of this common preoperative condition on postoperative outcomes is still a subject of debate. According to Khiabani et al., preoperative Afib is associated with an increased risk of all-cause morbidity and mortality in patients undergoing coronary artery bypass grafting (CABG). In addition, Malaisrie et al. found that patients with preoperative Afib have higher rates of reoperation, permanent stroke, prolonged ventilation, new renal failure, deep sternal wound infection, and in-hospital death. With the advent of the percutaneous era, determining the prevalence and potential effects of this comorbidity in coronary surgery is gaining importance[2-5].

In this study, the feasibility of coronary surgery for patients with preoperative Afib was evaluated. The primary outcome was in-patient outcomes, and the secondary outcome was coronary surgery outcomes such as repeat revascularization rate and overall survival.

PATIENTS and METHODS

Study Design

151 patients who underwent coronary bypass grafting surgery for ischemic heart disease were included in this study. This study has aimed to investigate preoperative Afib effects on coronary artery bypass grafting surgery results.

Ethical Approval

Our institute's ethical committee approved the study, which was conducted according to the ethical standards of the responsible committee on human experimentation (both institutional and national) as well as the Helsinki Declaration of 1975, revised in 2000 by the World Medical Association.

Data Collecting and Follow-up

Based on ethical approval, the primary surgeon who applied the treatment made the data collection. Demographic and medical features such as age, gender, body mass index, hypertension, carotid artery disease, previous myocardial infarction, additional structural heart disease, left ventricular ejection fraction, diabetes mellitus, chronic obstructive pulmonary disease, malignancy, obesity, preoperative hemoglobin, serum creatinine, preoperative glomerular filtration rate, and preoperative hematocrit were taken as preoperative features. Intraoperative death, sternal dehiscence, one-year revascularization requirement, acute kidney injury, cardiopulmonary resuscitation, perioperative complications including bleeding, stroke, thirty-day mortality, postoperative hematocrit, duration of intensive care (days) and hospital stay (days) were taken as postoperative outcomes. Intraoperative data such as the number of distal anastomoses, cardiopulmonary bypass time (minute), and aortic cross-clamp time (minute) were compiled from intraoperative notes by the assistant surgeon. The 12-month postoperative status was examined for follow-up by checking the national database.

Statistical Analysis

Categorical variables were reported as a proportion and were analyzed using χ^2 or Fisher exact tests, as appropriate. Continuous variables were reported as mean and were compared using student t-tests between the two groups. In addition, the log-rank Kaplan-Meier test was used for calculating the differences in 12-month survival among the groups.

RESULTS

Preoperative Status and Demographics

The study cohort's median age was 61.5 and 26.6% (n= 40) of the patients were female. The preoperative Afib was seen in 20 patients which makes up to 13.3% of all of our patients. There was no difference in demographics such as age (61.5 vs. 61.5, p= 0.582), gender distribution (27.3% vs. 20.0%, p= 0.491), and body mass index (29.0 vs. 28.6, p= 0.473) among the groups. Carotid artery disease prevalence (18.2% vs. 0.0%, p= 0.038) was statistically significantly higher in the control group however on the other hand previous myocardial infraction prevalence (38.9% vs. 70.0%, p= 0.009) was found significantly higher in the patients with the Afib group. The Afib group has worse renal functions than the control group (p= 0.002). The rest of the preoperative parameters such as additional structural heart disease, left ventricular ejection fraction, diabetes mellitus, chronic obstructive pulmonary disease, malignancy, obesity, preoperative hemoglobin, serum creatinine, and hematocrit were not found to be statistically different (p> 0.05).

Perioperative results

The mean number of distal anastomoses for the groups was 2.9 and 3.2. cardiopulmonary bypass time was 86.6 minutes and 85.3 minutes. Aortic cross-clamp time was found to be 51.9 minutes and 49.8 minutes. There was no significant difference between the control group and the Afib group in terms of intraoperative parameters (Table 2).

Table 1. Preoperative medical history

Variables	Control Group	Patients with Atrial Fibrillation	p
Age (mean)	61.5	61.5	0.582
Gender (female %)	27.3	20.0	0.491
Body Mass Index (mean)	29.0	28.6	0.473
Hypertension (yes, %)	50.8	45.0	0.631
Carotid Artery Disease (yes, %)	**18.2**	**0.0**	**0.038**
Previous Myocardial Infarction (yes, %)	**38.9**	**70.0**	**0.009**
Additional Structural Heart Disease (yes, %)	7.6	0.0	0.201
Left ventricular ejection fraction (% mean)	57.3	49.9	0.128
Diabetes mellitus (yes, %)	46.2	40.0	0.603
Chronic Obstructive Pulmonary Disease (yes, %)	22.7	30.0	0.476
Malignancy (yes, %)	3.1	5.0	0.650
Obesity (yes, %)	32.8	45.0	0.286
Preoperative Hb (g/dL)	13.5	14.4	0.823
Creatinine (mg)	0.98	0.97	0.422
Preoperative GFR (mL/min)	**85.9**	**69.7**	**0.002**
Preoperative Haematocrit (%)	40.3	42.5	0.751

GFR: Glomerular filtration rate.

Table 2. Intraoperative results

Variables	Control Group	Patients with Atrial Fibrillation	p
Number of distal anastomoses (n)	2.9	3.2	0.130
Cardiopulmonary bypass time (minute)	86.6	85.3	0.763
Aortic cross-clamp time (minute)	51.9	49.8	0.762

Intraoperative death has never been observed; however, 30-day mortality was 2.3% in the control group, even though it was not seen in the Afib group. Despite the low mean GFR in the Afib group, there was no significant difference between the control and the Afib groups in terms of acute kidney injury frequency. Regarding perioperative complications (perioperative complications general, sternal dehiscence, cardiopulmonary resuscitation requirement), no significant distinction between the groups was found, and recovery parameters such as intubation duration, length of intensive care unit (ICU) stay, and length of hospital stay. Interestingly, there was no significant difference between the two groups in terms of stroke in the postoperative period (Table 3).

Coronary Artery Bypass Grafting Outcomes

In this study, coronary artery bypass grafting outcomes were taken as 12-month repeat revascularization and 12-month overall survival. Repeat revascularization requirement was seen in one patient (0.7% overall), it was in the Afib group (0.0% vs 5.0%, p= 0.010). The overall survival rate was found to be 95.4% overall, which was 100.0% and 94.7% in the Afib group and control group respectively (p= 0.273).

DISCUSSION

Our study found a preoperative Afib prevalence of 13.3% in our cohort of patients undergoing coronary artery bypass grafting. A systematic review and meta-analysis conducted by Saxena et al. found a pooled prevalence of Afib in patients undergoing cardiac surgery of 5.1% (n= 19,706), with significant heterogeneity among the 12 studies (n= 389,998)[6]. In other studies, the incidence of Afib in patients undergoing coronary surgery typically falls within the range of 6.1% to 18.6%, with an average of approximately 10%[2-5]. Therefore, our results support the notion that Afib is a common comorbidity in patients undergoing CABG and highlights the need for clinicians to be aware of its presence when evaluating these patients.

Table 3. Postoperative outcomes

Variables	Control Group	Patients with Atrial Fibrillation	p	Odds Ratio
Intraoperative death (yes, %)	0.0	0.0	-	-
Sternal dehiscence (yes, %)	6.2	0.0	0.254	0.94
One-year revascularization requirement (yes, %)	**0.0**	**5.0**	**0.010**	**1.05**
Acute kidney injury (yes, %)	6.1	5.0	0.851	0.82
Cardiopulmonary resuscitation (in-hospital) (yes, %)	2.3	5.0	0.478	2.3
Perioperative complications including bleeding (yes, %)	6.1	5.0	0.851	0.82
Stroke (yes, %)	5.3	5.0	0.949	0.93
Thirty-day mortality (yes, %)	2.3	0.0	0.496	0.98
Postoperative Hct (%)	**29.0**	**30.4**	**0.000**	-
ICU duration (Days)	5.2	3.9	0.274	-
Length of stay inc. ICU duration (Days)	9.9	8.6	0.373	-

ICU: Intensive care unit.

In our study, the patients of both the preoperative Afib group and the control group had similar demographic, metabolic, systemic, and cardiovascular conditions. However, there were certain differences observed between the two groups. The incidence of previous myocardial infarction was higher in the preoperative Afib group, while the prevalence of carotid artery stenosis disease and mean GFR were lower. According to the study conducted by Malaisrie et al. patients with preoperative Afib who underwent CABG were found to be older and had a higher prevalence of comorbidities such as hypertension, renal failure, chronic lung disease, lower ejection fraction, and heart failure[3]. Furthermore, the study by Ad et al. reported that patients with preoperative Afib undergoing CABG were older and had a higher prevalence of diabetes mellitus, hypertension, and congestive heart failure[7]. According to the review by Khiabani et al., preoperative Afib is associated with a higher risk of perioperative complications and mortality[4]. Also, a recent meta-analysis carried out by Saxene et al. discussed that preoperative Afib is identified as an independent risk factor for adverse perioperative outcomes and decreased overall survival following CABG[6]. In contrast, no significant differences were found between the groups in terms of perioperative complications, such as sternal dehiscence, cardiopulmonary resuscitation requirement, and general complications in our study. Additionally, no significant differences were observed in the incidence of 30-day and 12-month survival between the groups.

Notably, our study demonstrated the absence of a significant difference in the incidence of postoperative stroke between the two groups. It is worth noting that previous studies have shown conflicting results regarding the association between preoperative Afib and postoperative stroke. Our finding is consistent with the results of some previous studies that did not report a noticeable rise in the occurrence of postoperative stroke among patients with Afib[3,8,9]. On the other hand, some previous studies showed that preoperative Afib is associated with an elevated risk of perioperative stroke[6,10]. In our study, the need for re-revascularization was found to be higher in the preoperative AF group. Despite the limited sample size, this finding is consistent with some previous studies that have reported higher rates of repeat revascularization in patients with preoperative Afib[11]. These findings highlight the need for careful follow-up and monitoring of patients with preoperative Afib who undergo coronary artery bypass grafting surgery. To achieve improved outcomes in these patients, current literature is discussing various points such as concomitantly arrhythmia surgery in severe cases or prophylactic medications preoperatively for arrhythmia, postoperatively for thromboembolic events[12,13]. In our institutional experience, we did not implement any additional or different medication protocols specifically for patients with preoperative atrial fibrillation. However, we have been implementing an enhanced recovery after surgery (ERAS) protocol for patients undergoing coronary artery bypass grafting (CABG), which includes practices such as early mobilization of patients. ERAS protocol might improve the outcomes in terms of length of stay and related complications[14].

Limitations of the study include its retrospective design, relatively small sample size, and short follow-up duration of 12 months. Additionally, the study only included patients undergoing isolated coronary artery bypass grafting surgery, so the findings may not be generalizable to other cardiac surgeries.

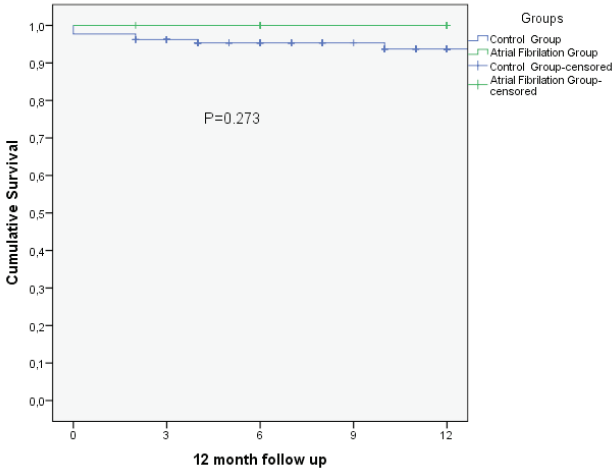

Figure 1. 12-month overall survival graph.

Future studies with larger sample sizes, longer follow-up durations, and more diverse patient populations may help to further explain the impact of preoperative Afib on CABG outcomes.

CONCLUSION

In conclusion, our study indicates that coronary artery bypass grafting surgery is a viable option for patients with preoperative atrial fibrillation. However, it is crucial to emphasize the importance of diligent follow-up and monitoring of these patients, particularly regarding the potential need for repeat revascularization.

Ethics Committee Approval: The approval for this study was obtained from Eskişehir City Hospital Non-invasive Clinical Research Ethics Committee (Decision no: ESH/GOEK 2023/2, Date: 15.03.2023).

Informed Consent: This is retrospective study, we could not obtain written informed consent from the participants.

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Conflict of Interest: The authors have no conflicts of interest to declare.

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