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Is Coronary Bypass Operation More Risky in Patients Undergoing Previous Percutaneous Coronary Intervention?

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ABSTRACT

Introduction: In this study we compare the factors affecting mortality and morbidity of the patients had coronary artery bypass graft (CABG) with/without percutaneous coronary intervention (PCI) prior to the CABG operation.
Patients and Methods: In our study a total of 214 patients who underwent CABG in our hospital between January 2006-2008 were included. They were divided into two groups as A and B. In group A, 135 patients in whom CABG was performed after PCI (mean age 52.5±8.8 years) were included; in group B, 79 patients in whom CABG was performed without any coronary intervention (mean age 51.8±8.8 years) were included. Both groups were evaluated in terms of demographic characteristics, comorbid diseases and medications, preoperative ejection fraction (EF) and functional capacity, durations of preoperative cardiopulmonary bypass (CPB) and cross clamp, number of distal bypass, whether bypass was performed on the coronary artery undergoing PCI, inotropic agent or intra-aortic balloon pump support at the time of referring to postoperative intensive care unit (ICU), duration of postoperative ICU stay and complications.
Results: Of the patients, 85% were males and 15% were females. In 73% (n=98) of the patients undergoing CABG following PCI, bypass was performed also on the artery undergoing PCI. The rate of malignant arrhythmia was higher in the group A in which CABG was performed following PCI as compared to the group B (8% (n=11) in the group A, 1% (n=1) in the group B). The rate of development of cerebrovascular event (CVE) was 4% (n=5) in the group A and 1% (n=1) in the group B. Postoperative mortality was 15% (n=22) in the group A and 3% (n=2) in the group B.
Conclusion: Although PCI may be a life-saving procedure in patients presenting with acute myocardial infarction, some serious complications may occur during the procedure. So an urgent surgical intervention may be necessary. In this study, mortality and morbidity of the CABG procedures performed after PCI are reported to be high.
Key Words: Coronary bypass; percutaneous coronary intervention; cardiopulmonary bypass; mortality

Öncesinde Perkütan Koroner Girişim Uygulanmış Hastalarda Koroner Bypass Daha mı Risklidir?

ÖZET

Giriş: Bu çalışmada, perkutan koroner girişim (PKG) sonrası koroner arter baypass greftleme (KABG) operasyonu uygulanan hastalarla, hiçbir perkutan koroner girişim olmaksızın KABG operasyonu geçiren hastaların mortalite ve morbiditeyi etkileyen faktörler açısından sonuçlarının karşılaştırılması amaçlandı.
Hastalar ve Yöntem: Ocak 2006 ve Ocak 2008 tarihleri arasında hastanemizde KABG uygulanmış olan 214 hasta çalışmaya dahil edildi. A ve B olmak üzere hastalar iki gruba ayrıldı. A grubuna, PKG sonrası KABG uygulanan 135 hasta (yaş ortalaması 52,5±8,8) dahil edilirken; B grubuna, hiçbir perkutan koroner girişim geçirmeksizin KABG uygulanan 79 hasta (yaş ortalaması 51,8±8,8) dahil edildi. Her iki grubun demografik özellikleri, komorbid hastalıkları ve kullandığı medikal tedaviler, preoperatif EF (ejeksiyon fraksiyonu) ve fonksiyonel kapasitesi, peroperatif kardiyopulmoner baypas (CPB) ve kros klemp süresi, distal bypass sayısı, PKG uygulanmış olan koroner artere baypas uygulanıp uygulanmadığı, postoperatif yoğun bakıma alınırkenki inotropik ajan veya intraaortik balon pompası (İABP) desteği, postoperatif yoğun bakımda hastanede yatış süresi ve komplikasyonları açısından değerlendirildi.
Bulgular: Araştırma kapsamında örneklemeye dahil edilen hastaların %85'i erkek, %15'i ise kadındı. PKG sonrası KABG uygulanan hastaların %73'ünde (n=98), PKG uygulanan damara da baypas yapıldı. PKG sonrası KABG uygulanan A grubunda, malign aritmi görülme oranı B grubuna göre belirgin derecede yüksekti (A grubunda %8 n=11; B grubunda %1 n=1). Postoperatif serebro vasküler olay (SVO) gelişimi, A grubunda %4 (n=5); B grubunda %1 (n=1)'di. Postoperatif mortalite, PKG sonrası KABG uygulanan A grubunda %15 (n=22), B grubunda ise %3 (n=2)'dü.
Sonuç: PKG, akut miyokard enfarktüsü ile başvuran hastalarda hayat kurtarıcı olabilmekle birlikte, işlem sırasında ciddi komplikasyonlar gelişebilmektedir. Çalışmamızda PKG sonrası uygulanan KABG operasyonlarının mortalitesi ve morbiditesinin yüksek olduğu görülmektedir.
Anahtar Kelimeler: Koroner bypass; perkütan koroner girişim; kardiyopulmoner bypass; mortalite

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INTRODUCTION

Coronary stenting has emerged as a method of treatment when suboptimal outcomes are obtained after percutaneous transluminal coronary angioplasty (PTCA) in coronary artery disease (CAD) or in acute occlusion[1]. Although it reduces the rate of restenosis as compared with PTCA, it has been associated with a range of life-threatening conditions, including acute and subacute stent thrombosis, stent embolism, intracoronary stent misplacement and perforation. During the procedure, myocardial infarction may develop due to stent embolism, thrombosis or acute occlusion; in-stent stenosis may also occur over time. Development of restenosis or rapid progression of atherosclerosis worsens long-term morbidity and mortality after stenting procedure[2,3]. The objective of this study is to compare the outcomes in terms of factors affecting mortality and morbidity of patients undergoing coronary artery bypass grafting (CABG) surgery after percutaneous coronary intervention (PCI) to those undergoing CABG without PCI.

PATIENTS and METHODS

The study included 214 patients who underwent CABG in our clinic between January 2006 and January 2008. The patients were divided into 2 groups as group A and group B; group A included 135 patients undergoing CABG after PCI (mean age 52.5±8.8 years); the B group comprised 79 patients were operated without any PCI (the mean age 50.5±8.8 years). Both groups were analyzed with regard to preoperative demographic characteristics, history of smoking, peripheral arterial disease (PAD), chronic obstructive pulmonary disease (COPD), chronic renal failure (CRF), cerebrovascular events (CVE), hypertension (HT), hyperlipidemia (HL), diabetes mellitus (DM) (insulin dependent or independent) and drug use (ACE inhibitors, β-blockers, statins, nitrate). The parameters evaluated included the interval between PCI and CABG, the functional capacity according to the classification of the Canadian Cardiovascular Society (CCS), the presence of limited exercise capacity (class 3-4), the history of myocardial infarction (MI) in the past month, left ventricular function (according to the findings on echocardiography, ejection fraction (EF) under <50% was considered as low EF). Whether any intervention was performed on the vessel where PCI had been done at CABG operation and the length of aortic cross-clamp and cardiopulmonary bypass procedure were studied. In the immediate postoperative period, both groups were compared with respect to duration of ventilation (hours), both length of hospital and postoperative intensive care unit (ICU) stay (day). The results were compared in respect of development of postoperative morbidity and acute renal failure (ARF), stroke as well as malignant arrhythmias such as ventricular fibrillation/ventricular tachycardia (VF/VT) and re-exploration (for bleeding after CABG) and mortality.

Same protocol of anesthesia and surgery were applied for both of two groups. Most of the patients were operated by CPB, using aortic cross clamp and antegrade/retrograde cardioplegia for myocardial protection. Otherwise, fifteen of the patients (13 patients of group A, 2 patients of group B) were operated by beating heart.

Data analysis was performed using SPSS (Statistical Package for Social Science) program. The Student's t-test was used to compare quantitative data as well as descriptive statistical methods (mean, standard deviation) in the inter-group comparisons of parameters showing normal distribution. The chi-square test was used to compare qualitative data. The risk factors that affecting mortality were evaluated by "Enter logistic regression analysis". $P<0.05$ was considered significant. The Logistic Regression Analysis module of SPSS was used.

RESULTS

The demographic characteristics of both groups were examined. Of patients, 85% were males and 15% were females. The mean age of patients undergoing stent implantation was 52.5±8.8, while the average age of patients without stenting procedure was 50.5±8.8 years. The mean age of all patients was 51.8±8.8 years. No difference was noticed between group A and B. It was found that 77% of patients undergoing stent implantation during PCI (n=101) had drug-eluting stents (DES), while 23% (n=31) had bare metal stents (BMS). Body mass index (BMI) of 12% of patients were below 17, and that of 32% of patients ranged from 17 to 25. BMI of 56% patients was over 25. In 19% of patients in group A, BMI was under 17, in 34% of patients it ranged from 17 to 25 and in 47% of patients BMI was above 25. BMI ranged from 17 to 25 in 29% of patients in group B and it was higher than 25 in 71% in the same group.

The rate of insulin-dependent DM was significantly higher in group B. Considering the presence of insulin-dependent DM no noticeable difference was observed in both groups (there was no difference between the two groups according to the Chi-square test). According to the classification of CCS 43% of the patients in both groups had limited exercise capacity of class 3-4. The group A had significantly higher rates as compared with group B (Group A had 50%, n=68, group B had 30%, n=24). Looking at 1-month-period before the operation, we found that group A had a much more frequent history of MI (group A 64%, n=86, the B group had 37%, n=29). There was a statistically significant difference between the two groups. Table 1 shows the preoperative risk factors in detail.

The average interval between PCI and CABG in patients undergoing early PCI was 268.8 days. When the patients were classified according to the time elapsed between PCI and CABG, there were many more patients present in "between 1-2 weeks" and "longer than 6 months".

The mean cardiopulmonary bypass time was 87.5 minutes in group A, while it was 113.3 minutes in group B. When both groups were compared, the duration of bypass grafting was statistically longer in group B (t-test value =-4513, df=197, p=0.000). Aortic cross-clamp time was 53.3 minutes in group A and this was 77.4 minutes in group B. It was 61.8 minutes on average in the two groups. Group B had a significantly longer duration of aortic cross-

Table 1. Distribution of preoperative comorbid factors according to groups

		Group A		Group B		Total	
		No	%	No	%	No	%
DM	Not	104	77	52	66	156	73
	Type 1 DM	22	16	21	27	43	20
	Type 2 DM	9	7	6	8	15	7
	Total	135	100	79	100	214	100
Chi-square: 3.55				**df: 2**		**Sig.: 0.17**	
HT	Not	94	70	32	41	126	59
	Present	41	30	47	59	88	41
	Total	135	100	79	100	214	100
Chi-square: 17.46				**df: 1**		**Sig.: 000**	
HL	Not	104	77	68	86	172	80
	Present	31	23	11	14	42	20
	Total	135	100	79	100	214	100
Chi-square: 2.58				**df: 1**		**Sig.: 0.11**	
Tobacco usage	Not	82	61	45	57	127	59
	Present	53	39	34	43	87	41
	Total	135	100	79	100	214	100
Chi-square: 0.29				**df: 1**		**Sig.: 0.59**	
Stroke	Not	129	96	79	100	208	97
	Present	6	4	0	0	6	3
	Total	135	100	79	100	214	100
COPD	Not	132	98	71	90	203	95
	Present	3	2	8	10	11	5
	Total	135	100	79	100	214	100
Chi-square: 6.39				**df: 1**		**Sig.: 0.01**	
PVD	Not	132	98	76	96	208	97
	Present	3	2	3	4	6	3
	Total	135	100	79	100	214	100
Chronic renal failure (CRF)	Not	133	99	79	100	212	99
	Present	2	1	0	0	2	1
	Total	135	100	79	100	214	100
Beta Blocker usage	Not	49	36	45	57	94	44
	Present	86	64	34	43	120	56
	Total	135	100	79	100	214	100
Chi-square: 8.64				**df: 1**		**Sig.: 0**	
Statin usage	Not	87	64	57	72	144	67
	Present	48	36	22	28	70	33
	Total	135	100	79	100	214	100
Chi-square: 1.35				**df: 1**		**Sig.: 0.25**	
ACE Inhibitor usage	Not	83	61	54	68	137	64
	Present	52	39	25	32	77	36
	Total	135	100	79	100	214	100
Chi-square: 1.02				**df: 1**		**Sig.: 0.31**	
Nitrat usage	Not	81	61	52	66	133	63
	Present	52	39	27	34	79	37
	Total	133	100	79	100	212	100
Chi-square: 0.51				**df: 1**		**Sig.: 0.47**	

clamping (t-test value =-6310, df=197, p=0.000). Group A (n=75) had low preoperative EF (left ventricular EF less than 50%) 56%, while group B (n=65) had 82%. Preoperative low EF rate was statistically significantly elevated in group B. This partly accounts for the length of CABG and aortic cross clamping in group B.

The average number of bypass performed for a patient during the operation was 2.63, its median was 3. There was no significant difference in the average number of bypass between the two groups (group A: 2.54; group B: 2,78). A total of 73% patients (n=98) underwent bypass surgery on the vein where PCI procedure was performed who had undergone CABG following PTCA / stent implantation.

Due to bleeding in the immediate postoperative period, re-exploration was performed for 2% of patients. Of group A, 3% of patients underwent re-exploration because of bleeding, while in group B 2% of patients underwent the same procedure. A

Table 2. Distribution of postoperative complications according to groups

		Group A		Group B		Total	
		No	**%**	**No**	**%**	**No**	**%**
IABP usage	Not	106	79	77	97	183	86
	Present	29	21	2	3	31	14
	Total	135	100	79	100	214	100
Chi-square: 14.45				**df: 1**		**Sig.: 000**	
SVT	Not	131	98	78	99	209	98
	Present	3	2	1	1	4	2
	Total	134	100	79	100	213	100
Chi-square: 3.16				**df: 1**		**Sig.: 0.08**	
VT	Not	122	92	78	99	200	94
	Present	11	8	1	1	12	6
	Total	133	100	79	100	212	100
Chi-square: 4.55				**df: 1**		**Sig.: 0.03**	
Acut renal failure (ARF)	Not	130	96	77	97	207	97
	Present	5	4	2	3	7	3
	Total	135	100	79	100	214	100
Chi-square: 0.22				**df: 1**		**Sig.: 0.64**	
Stroke	Not	130	96	78	99	208	97
	Present	5	4	1	1	6	3
	Total	135	100	79	100	214	100
Chi-square: 1.09				**df: 1**		**Sig.: 0.3**	
Re-exploration for bleeding	Not	132	98	77	97	209	98
	Present	3	2	2	3	5	2
	Total	135	100	79	100	214	100
Chi-square: 0.02				**df: 1**		**Sig.: 0.89**	
Re-exploration for cardiac arrest	Not	127	94	77	97	204	95
	Present	8	6	2	3	10	5
	Total	135	100	79	100	214	100
Chi-square: 1.29				**df: 1**		**Sig.: 0.26**	

Table 3. Distribution of mortality according to groups

		Group A		Group B		Total	
		No	**%**	**No**	**%**	**No**	**%**
Mortality Rates	Recovery	115	85	77	97	192	90
	Died	20	15	2	3	22	10
	Total	135	100	79	100	214	100
Chi-square: 8.15				**df: 2**		**Sig.: 0.004**	

total of 5% patients underwent re-exploration due to cardiac arrest (6% in group A, about 3% in group B). The two groups did not differ significantly in terms of re-exploration after cardiac arrest and bleeding.

The average postoperative intubation time was 31.6 hours in general, with the period being 40.2 hours in group A, and 17.7 hours in group B (t-test value =1.757, df=204, p=0.080). The mean postoperative ICU stay was 3.7 days. This was 4.7 days in group A, whereas it was 2 days in group B. The patients undergoing CABG after PCI (group A) stayed in ICU for a longer duration (t-test value =2.191, df=212, p=0.030). Far more patients in group A stayed more than 1 week in ICU. Both ICU and hospital stay were longer in group A (t-test value =2.298, df=212, p=0.023). Again, 42% of patients in group A stayed in the hospital for 1 to 2 weeks, while 59% of patients in group B stayed in the hospital for less than one week. Intra-aortic balloon pump (IABP) was required in 14% of patients. Of group A, 21% of patients underwent IABP, while only 3% of those in group B underwent IABP. These values were statistically significant (according to the chi-square test). Of the two groups, 3% developed ARF (4% in group A, 3% in group B). No statistically significant difference was noted between the two groups. In both groups 6% of patients (n=12) had malignant arrhythmias (VT/VF). Group A had significantly higher than the percentage of patients than group B (group A 8%, n=11, group B 1%, n=1) and these values are statistically significant,. Postoperative SVT (supraventricular tachycardia) was observed in 2% of patients. Postoperative stroke was found to be higher in the patients undergoing CABG following PCI as compared with those in group B undergoing only CABG (group A 4%, n=5, the B group 1%, n=1 and a total 3%, n=6). This difference was statistically significant. Table 2 shows a detailed the distribution of postoperative complications in the groups.

Total mortality rate was 10% (n=22); it was 15% in group A (n=20), while the rate was about 3% (n=2) in group B. The mortality rate in the patients of group A who underwent surgery after PCI was found to be more frequent. These values were statistically significant. Table 3 shows a detailed the distribution of mortality in the groups.

Risk factors affecting mortality

Mortality was observed to increase when a patient undergoes CABG after PCI (OR: 6.696, 95%: CI 1.52 to 29.47). There was no statistically significant difference with regard to mortality rates in DES patients or BMS patients (OR: 2.042, 95% CI: 0.73-5.68 in DES implantation). It was observed that surgical procedure performed on the stented vessel had no significant effect on mortality (OR: 1.61; 95% CI: 0.41-29.03). Postoperative stroke had a significant effect on the development postoperative mortality (OR: 9.947; 95% CI, 1.88-52.76).

DISCUSSION

There is growing debate about the appropriate treatment modality due to the increased incidence of ischemic heart diseases and developments in invasive and surgical procedures. The most important disadvantages of stents are the mechanical problems resulting from implantation of stents inside coronary artery and re-stenosis. The endothelial damage, which is the major cause of in-stent restenosis, has been tried to overcome by direct stent implantation, as well as with the use of glycoprotein IIb-IIIa inhibitors and clopidogrel prior to intervention[3,4]. A number of studies, primarily the SYNTAX study, have reported that higher rates of repeat revascularization after PCI were noted as compared with CABG, despite developments in invasive cardiology, including successful intra-coronary stenting procedure together with PTCA[5-7]. According to a 5-year-results of the study performed by Fortuna et al.[8] for patients with left main and multi-vessel CAD it was found that rates of mortality, MI and revascularization were lower in the group undergoing CABG as compared with those undergoing PCI. In a similar study by Hlatky et al.[9] the long-term mortality rates of CABG were lower compared to those of PCI in patients with multivessel disease. However, it has been reported that the factors such as DM, smoking, heart failure, or the presence of PAD showed discrepancy in the success rates of CABG[10]. Today, morbidity and mortality after coronary artery surgery remain a major problem.

No statistically significant differences were found between the groups in terms of the demographic data, preoperative risk factors (PAD, DM, HL, chronic renal disease and smoking) and preoperative medications. Of both the groups, 43% of cases had very limited exercise capacity in (class 3-4); this was found to be 50% in the PCI group. Of the patients, 53% experienced MI in the past month and this rate was 64% in the PCI group. Increased rate seen in the PCI group have suggested the elevated rates of stent thrombosis and re-stenosis. Again, patients presenting with acute MI who were candidates of multivessel coronary artery bypass surgery after PCI were also in this group. Contrary to the rates of previous MI and limited exercise capacity, group A (undergoing CABG after PCI) had statistically significantly shorter duration of cardiopulmonary bypass and aortic cross clamping, compared to group B. Group B included the patients with lower EF compared to those being candidate for CABG after PCI (it was 56% in group A (n=75), while 82% in group B (n=65)). These results were consistent with the literature[6]. We think that this partly explains the length of aortic cross clamping and CPB during CABG.

Although there were no significant differences in preoperative risk factors in both of our groups, we noted that the group undergoing PCI had higher postoperative mortality and morbidity rates. One of the important results of this study was that 73% of patients who were operated after PCI (n=98) underwent bypass on the coronary artery where PCI had been performed. It was one of the reasons for re-stenosis, but it failed. The rate of the patients in group A developing postoperative malignant arrhythmia (VF/VT) was significantly higher as compared with that of the patients in group B (group A 8%, n=11, group B 1%, n=1) and these values were statistically significant (according to chi-square test). A retrospective review showed that some patients had developed postoperative acute occlusion of the non-bypassed artery. Significant reductions in the rates of

re-stenosis have been reported as a result of inhibitory effects of drug-eluting stents on intimal proliferation[11]. Despite all these developments, the mechanical manipulations at the operation could cause damage to the stent in patients undergoing CABG without stenosis inside the stented coronary artery. Also, acute stent thrombosis may occur as a result of hemodynamic problems (hypotension, hypercoagulability, etc.). Cardiac arrest, or malignant arrhythmias are encountered in the early postoperative period in these patients. All these not only remind us of the need for a high index of attention in the presence of patent intracoronary stents in patients who are candidates of coronary bypass surgery but also give clues for the high incidence of by-pass surgery in stented patients[2-12].

A number of these patients (14.8%, n=20) were those who had acute stent thrombosis, failed PTCA/stent implantation on the same day, or those developing coronary artery dissection or rupture during the procedure. These patients underwent emergency CABG surgery on the same day.

While there was no significant difference in terms of the need for re-exploration due to the massive drainage in both groups, higher incidence of postoperative cardiac arrest after PCI and increased need for re-exploration after cardiac arrest were noted in group A undergoing CABG.

Need for postoperative IABP was significantly higher in group A as well. All these elucidate the length of time when ventilator was removed from the PCI group, monitorization of postoperative ICU and duration of hospital stay. The mortality rate was 3% in group B, while it was around 15% in the PCI group. Implementation of PCI before CABG was found to increase the mortality rate 6.6-fold. Of course, here, it has to be pointed out that patients requiring urgent CABG due to complications such as acute stent thrombosis, coronary artery dissection or perforation during the implementation of PCI had a great effect on the rate; however, it should not be ignored that PCI is a life-saving procedure in patients presenting with acute myocardial infarction.

Although data on the long-term outcome of DES remain unclear, more and more patients with multivessel disease are undergoing PCI with DES[2]. More successful results with drug eluting stents compared with bare metal stents and bypass surgery particularly in diabetic patients have recently been one of the most important developments in interventional cardiology as[13]. Two major studies have been conducted in recent years related to this issue such as BARI 2D, FREEDOM[14,15]. Of the patients undergoing CABG or PCI due to the multiple vessel disease, 25%-30% had diabetes[14]. In accordance with the literature, in this study 27% of patients had DM and DES were implanted to 77% of patients who underwent PCI (n=104). In our study, the early mortality rates did not differ significantly in patients undergoing CABG after either DES or BMS. Here, it is necessary to remind that the aim of our study was not to evaluate PTCA intervals after BMS or DES. When the patients were classified according to the time elapsed between the PCI and CABG operation, there were far more patients in "1-2 weeks" and "more than 6 months. When the patients in "1-2 weeks were retrospectively reviewed, a significant number of patients (14.8%, n=20) were found to experience acute stent thrombosis, failed PTCA / stent implantation, coronary artery dissection or rupture on the same day as the procedure.

These patients were those who presented with acute coronary syndrome and underwent emergency CABG on the same day. The mortality rate was high in these patients (30%, n=6). It should not be ignored that this group had an effect on mortality rates of our patients undergoing CABG after PCI. The majority of patients undergoing CABG after PCI with a 1 to 2-week-interval presented with multi-vessel CAD and acute MI. Initially we performed revascularization for occluded coronary artery with PTCA/stent implantation. After the first approach we planned immediate coronary bypass procedure.

PCI is a life-saving procedure in this group. Although the incidence of postoperative stroke in patients undergoing CABG after PCI was not statistically significantly higher, it was found to be more elevated in patients undergoing CABG without attempted PCI (in group A, 4% n=5, in group B 1%, n=1, and a total of 3%, n=6) in our study. Although the difference between the rates of postoperative stroke was not statistically significant, its development was associated with a 9.9-fold increase in mortality rate. It is suggested that high mortality rate should not be overlooked in patients undergoing CABG after PCI. According to the five-year-results of the SYNTAX[6] study comparing PCI and coronary bypass surgery in patients with three-vessel and left main coronary artery disease, the stroke rate after PCI was 2.4%, and after CABG it was 3.7%. Although these are not directly compatible with the SYNTAX study they are close each other. The history of preoperative stroke was significantly higher in the PCI group (in group A 4% (n=6) in group B 0% n=0).

PCI can be life saving in patients presenting with acute MI. However, serious complications may occur during the procedure and result in abnormalities requiring emergent surgery. The need for revascularisation after PCI is still higher than CABG. In our study, the mortality and morbidity of CABG after PCI are higher. We believe that decisions are made by closed collaboration of cardiologists and surgeons may increase the succes of mid and long term results in CAD patients undergo emergent or elective PCI or CABG in CAD.

CONFLICT of INTEREST

The authors reported no conflict of interest related to this article.

REFERENCES

1. Ito C, Sasaki H, Ishida S, Maade R, Hareda H. Is insulin resistance the main cause of impaired fasting glycemia? The International Diabetes Federation Abstract Volume of The 18th Congress. S:144
2. SoS Investigators. Coronary artery bypass surgery versus percutaneous coronary intervention with stent implantation in patients with multivessel coronary artery disease (the Stent or Surgery trial): A randomised controlled trial. Lancet 2002;360:965-70.
3. Erdoğan HB, Erentuğ V, Sareyyüpoğlu B, Sönmez K, Güzelmeriç F, Kırali K, ve ark. İntrakoroner Stent İmplantasyonu Sonrası KABG Uygulanan Olguların Klinik ve Anjiyografik Özellikleri. Turk Gogus Kalp Dama 2005;13:1-5.

4. Ökmen E, Şanlı A, Kaşıkçıoğlu H, Dayı S, Cam N. Effects of glycoprotein IIb/IIIa inhibition with tirofiban on minor myocardial injury in successful coronary angioplasty. Cardiology 2004;102;18-23.
5. Ökmen E, Kaşıkçıoğlu H, Uyarel H, Erdem I, Vural M. The effects of direct stent implantation and conventional stent implantation on minor myocardial injury in percutaneous coronary intervention. J Am Coll Cardiol 2002;39:320B.
6. Mohr FW, Morice M C, Kappetein P, Feldman T E, Stalhe E, Colombo A, et al. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary disease: 5-year follow-up of the randomised, clinical SYNTAX trial. Lancet 2013;381:629-38.
7. Hannan R L, Racz M, Walford G, Jones R H, Ryan T J, Bennett E, et al. Long-Term Outcomes of Coronary-Artery Bypass Grafting versus Stent Implantation. N Engl J Med 2005;352:2174-83.
8. Fortuna D, Nicolini F, Guastaroba P, De Palma R, Di Bartolomeo S, Saia F, et al; RERIC (Regional Registry of Cardiac Surgery); REAL (Regional Registry of Coronary Angioplasties) Investigators. Coronary artery bypass grafting vs percutaneous coronary intervention in a 'real-world' setting: a comparative effectiveness study based on propensity score-matched cohorts. Eur J Cardiothorac Surg 2013;44:e16-24.
9. Hlakty MA, Boothrody DB, Baker L, Kazi DS, Solomon MD, Chang TI, et al. Comparative effectiveness of multivessel coronary bypass surgery and multivessel percutaneous coronary intervention: a cohort study. Ann Intern Med 2013;158:727-34.
10. Johnson RG, Sirois C, Thurer RL, Sellke FW, Cohn WE, Kuntz RE, et al. Predictors of CABG within one year of successful PTCA: A retrospective, case-control study. Ann Thorac Surg 1997;64:3-7.
11. Okmen E. Did drug eluting stents change the management of coronary artery disease in diabetic patients?. Turk Gogus Kalp Dama 2008:16:198-204.
12. Bansilal S, Farkouh ME, Hueb W, Ogdie M, Dangas G, Lansky AJ, et al. The Future revascularization evaluation in patients with diabetes mellitus: optimal management of multivessel disease (FREEDOM). Am Heart J 2012;164:591-9.
13. Moses JW, Leon MB, Popma JJ, Fitzgerald PJ, Holmes DR, O' Shaughnessy C, et al. Sirolimus-eluting stents versus standart stents in patients with stenosis in a native coronary artery. N Eng J Med 2003;349:1315-23.
14. Eduardo AT, Alan B. Effects of surgical manipulation on coronary stents: Should surgical strategy be altered? Ann Thorac Surg 1997;63:37-40.
15. Chaitman BR, Hardison RM, Adler D, Gebhart S, Grogan M, Ocampo S, et al; Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) Study Group. The Bypass Angioplasty Revascularization Investigation 2 Diabetes randomized trial of different treatment strategies in type 2 diabetes mellitus with stable ischemic heart disease: impact of treatment strategy on cardiac mortality and myocardial infarction. Circulation 2009;120:2529-40.