

Coronary artery events one year after revascularization: a single center experience

Eventos de la arteria coronaria un año después de la revascularización: una experiencia de un solo centro

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Abstract

The most widely used myocardial revascularisation technique is PCI with stent implantation. Despite demonstrated protection and effectiveness, following implantation, adverse cardiovascular clinical effects do arise. The implementation of drug-eluting stents (DES) has contributed to a huge change in the issue of restenosis. The coronary tree as a whole appears to be affected by better coronary artery disease (CAD) pharmacological therapy and comprehensive secondary mitigation steps. **Aim of the study:** To study the major adverse cardiac events and one year outcome after PCI. **Patients & Methods:** This study is cross-sectional study of all patients who were referred to Iraqi Center for heart disease, for further evaluation of suspected coronary artery disease (CAD) for the period January to July 2018. The total number of patients was fifty (50). **Results:** The total No. of patients were 50, mean age was 59.1 ± 11.3 , (22%) were below age 45 and (78%) equal and above age 45 year. 54% were male and (46%) were female. The frequency risk factors were DM (62%), HT (56%), Dyslipidemias (52%), Obesity (21%) and Smoking (21%). The most common clinical presentations were chronic stable angina (98%) of cases and one case (2%) acute coronary syndrome. The outcome of PCI after one year divided in to four groups, group A: patients with ISR (5/50) (10%), group B: patients with new stenosis (8/50) (16%), group C: patients combined lesions (16/50) (32%) and group D (21/50) (42%) cases were normal. **Conclusion:** After one year from PCI there was high frequency of recurrence of symptoms exceeding half of the patients, most of them due to development of new lesion.

Resumen

La técnica de revascularización miocárdica más utilizada es la ICP con implante de stent. A pesar de la protección y eficacia demostradas, tras la implantación surgen efectos clínicos cardiovasculares adversos. La implementación de stents liberadores de fármacos (DES) ha contribuido a un gran cambio en el problema de la reestenosis. El árbol coronario en su conjunto parece verse afectado por una mejor terapia farmacológica de la enfermedad de las arterias coronarias (EAC) y pasos secundarios integrales de mitigación. **Objetivo del estudio:** estudiar los principales eventos cardíacos adversos y el resultado un año después de la ICP. **Pacientes y métodos:** este estudio es un estudio transversal de todos los pacientes que fueron remitidos al Centro Iraquí por enfermedades cardíacas, para una evaluación adicional de sospecha de enfermedad de las arterias coronarias (EAC) durante el período de enero a julio de 2018. El número total de pacientes fue de cincuenta (50). **Resultados:** El No. total de pacientes fue 50, la edad media fue $59,1 \pm 11,3$, (22%) tenían menos de 45 años y (78%) iguales y mayores de 45 años, 54% eran hombres y (46%) eran mujeres. Los factores de riesgo de frecuencia fueron DM (62%), HTA (56%), Dislipidemias (52%), Obesidad (21%) y Tabaquismo (21%). Las presentaciones clínicas más frecuentes fueron angina estable crónica (98%) de los casos y un caso (2%) síndrome coronario agudo. El resultado de la ICP después de un año dividido en cuatro grupos, grupo A: pacientes con ISR (5/50) (10%), grupo B: pacientes con nueva estenosis (8/50) (16%), grupo C: pacientes las lesiones combinadas (16/50) (32%) y los casos del grupo D (21/50) (42%) fueron normales. **Conclusión:** Después de un año de ICP hubo una alta frecuencia de recurrencia de los síntomas superior a la mitad de los pacientes, la mayoría por desarrollo de nueva lesión.

The most widely used myocardial revascularization technique is percutaneous coronary intervention (PCI) with stent implantation. Despite the proven efficacy and effectiveness of PCI, following stent implantation, adverse cardiovascular clinical effects do arise, impairing the short-and long-term result. Traditionally, the operation is related to cases arising during the 1st month after PCI and called periprocedural, while those that occur later emerge either from the stented (target) lesion or from disease development at other locations in the coronary tree^{1,2}. Important advances in stent implantation procedures have been achieved over the last decade. The invention of drug-eluting stents (DES) and their widespread use also contributed to a major change in the issue of restenosis. Continuous improvement of the configuration of the stent, the eluted medication and its delivery mechanisms and the adjunctive antiplatelet pharmacotherapy, A substantial part of the interventional cardiology literature was taken up, reflecting the importance paid to the stented site care. In the other hand, increased pharmacological management of coronary artery disease (CAD) and intensive secondary prevention interventions (e.g. alteration of risk factors) tend to affect the coronary tree as a whole. New research on the role of disease development as a cause of late-post-PCI events²⁻⁶.

Stent implantation PCI can lead to in-stent restenosis (ISR) and stent thrombosis (ST) ISR is a major concern for DES, but with a greatly decreased incidence, primarily for bare metal stents (BMS) and ISR. ST is an unusual complication of similar occurrence in DES patients and those with BMS. Although rare, ST is frequently related to serious symptoms, including mortality and myocardial infarction. Most prominently, there has been proof that there could be a link between the course of sickness and ISR. Progression of atherosclerotic disease beyond the stented coronary segment will contribute to the growth of localized plaque. It has been recognised that coronary lesions found during PCI that are initially non-culprit will easily grow into clinically important lesions^{17,18}.

Traditional risk factors for CAD are fairly assumed to be consistent with disease development in non-standard parts. The slowest CAD development was found in patients with low low-density lipoprotein (LDL) and normal systolic blood pressure. The most significant major cardiovascular disease predictor for disease development is baseline diabetes. The determination of unique plaque features predictive for potential angiographic and clinical development is a difficult problem. In vitro imaging of the fragile plaque was primarily defined using invasive techniques. Angioscopy provides a clear visualization of the plaque, allowing the surface to be analyzed and tears and thrombi to be identified. It is difficult to conduct and

confined to the proximal portion of the vessels in its application. Morphological research, mainly autopsy studies, show that the precursor to ruptured plaque is thin cap fibroatheroma (TCFA)²⁶. In contrast to in vitro histopathology, IVUS virtual histology is a promising modality of vulnerable plaque diagnosis that is highly reliable. For deceleration of disease development or even reversal of atherosclerotic lesions, intensive global risk adjustment in patients with CAD is of vital significance. Statins have been identified in order to increase the clinical outcome of patients with stable CAD and acute coronary syndromes following PCI. The relevance of lifestyle and post-PCI pharmacological treatments is stressed in the latest CAD secondary preventive guidelines). In statin-treated patients, IVUS trials revealed reversal or no worsening in coronary plaque in statin-treated patients and substantial improvements in the volume of the necrotic heart and fibrofatty plaque³⁶.

Post-PCI dual antiplatelet therapy is commonly offered specifically to prevent stent thrombosis. Patients with reported previous MI, ischemic stroke, or symptomatic peripheral artery disease have also been found to benefit from clopidogrel and aspirin administration. In real-world clinical experience, the execution of secondary preventive strategies is sometimes frustrating. Despite appropriate risk modification and modern pharmacological care, CAD also advances over time⁴⁰.

The aim of the study

To study the major adverse cardiac events and one year outcome after PCI.

Methods

This is cross-sectional study conducted at Iraqi Center for Heart disease (ICHD), all patients who were referred to ICHD for the period from January to July 2018, were included. The total No. of patients was fifty; the demographic characteristics for all patients were recorded, including, age, gender, conventional cardiovascular risk factors, BMI.

All patients had history of revascularization with PCI one year ago whom complaining chronic stable angina except one patient complain ACS are underwent coronary angiography included in this study. Any patient considered to be diabetics if has one of American Diabetic Association diagnostic criteria, FBS (8 hr fasting) equal or above 126mg(7mmol), 2hr post prandial equal or above 200mg(11mmol), RBS above 200mg in patient with characteristic symptoms of DM or HbA1C equal or above 6.5% was consider to be diabetic. Any patient with blood pressure equal or above 140/90 for more than three reading or on antihypertensive medication was considering being hypertensive. Any patient who smoked greater than 100 cigarettes in their life time and has smoked in the last 28

days was considering being smoker.

Dyslipidemic refer to any patient has fasting total cholesterol above 200 mg and or triglyceride above 150 mg. Coronary Angiographic notes reviewed. Single vessel disease was considered present if there was more than 70% diameter stenosis on visual assessment in the left anterior descending (LAD), left circumflex (LCX), right coronary (RCA) arteries, or $\geq 50\%$ left main stenosis or for in-stent restenosis of the stented artery.

Post-procedure access sheaths were removed with use of compressors. All patients were followed-up until discharge. The access site was examined for any local complications. Discharged patients were given clinic follow-up appointments.

Regarding the coronary angiography

The procedure is done under local anesthesia. Preoperative tests including renal function, viral screen, baseline resting ECG, few hours fasting before the test, record any history of asthma, drugs or contrast allergy, half evening and withdrawal of morning dose of anti-diabetic drugs. The procedure done by insertion of 6 Fsheath through femoral or radial artery access (Sildenger technique), injection of contrast in RT and LT coronary artery by 6F 90 -110 cm diagnostic catheter, the procedure end within 20 -30min, the patient remain under observation, and sheath removed few min after the end of the procedure with pressure on the site of sheath insertion for 15-30 min, avoid movement out of the bed for at least 4hrs, then the patient can be discharge if no complications.

Statistical analysis

SPSS version 23 was used for data entry and analysis. Frequency, percentage and figures were used to represent categorical data. Chi-square test (fisher exact test if not applicable) tests was used to confirm significance. $p \leq 0.05$ considered significant.

Results

As shows in the table 1 the characteristics of the patients were the total No. of patients were 50, mean age was 59.1 ± 11.3 , eleven (22%) were below age 45 and thirty-nine (78%) equal and above age 45. Twenty-seven (54%) were male and twenty-three (46%) were female. The frequent risk factors were as follows: DM: thirty-one (62%), HT: twenty-eight (56%), Dyslipidemias: twenty-six (52%), Obesity: twenty-one (21%) and Smoking: twenty-one (21%), the most common clinical presentations were chronic stable angina in forty-nine cases (98%) and one case (2%) acute coronary syndrome. Forty-one (82%) cases were treated by PTCA & DES and only nine cases (18%) treated by PTCA. Forty-one (82%) cases were treated with DES. The frequent involved arteries were, LAD: thirty-one (62%), RCA: thirteen (26%), LCX: four (8%) and LCX & LAD: two (4%).

Table 1. Baseline characteristics of the patients (n=50)

		(No, %)
Age groups	<45	11 (22%)
	≥ 45	39 (78%)
sex	Female	23 (46%)
	Male	27 (54%)
Risk factors		
DM		31 (62%)
HTN		28 (56%)
Dyslipidemias		26 (52%)
Obesity		21 (42%)
Smoking		21 (42%)
Clinical presentation	ACS	1 (2%)
	CSA	49 (98%)
mode of treatment	PTCA & DES	41 (82%)
	PTCA	9 (18%)
Type of stent	DES	41 (82%)
Involved artery	LAD	31 (62%)
	LCX	4 (8%)
	LCX & LAD	2 (4%)
	RCA	13 (26%)

The outcome of PCI after one year shown in table 2 represented as four groups, group A: - five patients with ISR, group B: - eight patients with new stenosis, group C: - sixteen patients combined lesions and group D: - twenty-one cases were normal. Age patients equal or more than 45 y statistically significant in group A(5/5) (100%) and group B(8/8) (100%),(P. value 0.04). Male gender statistically significant in group A (3/5)(60%) and group B (5/8) (62.5%),(P. value 0.03). Diabetes mellitus in group B and C (8/8) (100%),(14/16) (87.5%) respectively and dyslipidemia in group B and C (5/8) (62.5%),(14/16) (87.5%) respectively both statistically highly significant (P.value0.001). Hypertension (13/16) (81.3%) and smoking (12/16) (75%) statistically significant in group C (P. value 0.02). Obesity high frequent in group B (7/8) (87.5%) but statistically in significant (P. value 0.08).

All patients presented with chronic stable angina (49/50) (98%) but only one case presented as acute coronary syndrome. The mode of treatment was PTCA in group A (3/5) (60%) and PTCA and DES in group B (8/8) (100%) (P. value 0.02).

Patient s(n=50)		post PCI out come								p-value
		Group A Late ISR (n=5)		Group B new stenosis(n=8)		Group C combined (n=16)		Group D Normal angiography(n=21)		
		No.	%	No.	%	No.	%	No.	%	
Age groups										
	<45	0	0.0%	0	0.0%	7	43.8%	4	19.0%	0.04
	≥45	5	100.0%	8	100.0%	9	56.3%	17	81.0%	
sex										
	F	2	40.0%	3	37.5%	11	68.8%	7	33.3%	0.03
	M	3	60.0%	5	62.5%	5	31.3%	14	66.7%	
Risk factors										
DM		3	60.0%	8	100.0%	14	87.5%	6	28.6%	0.001
HT		3	60.0%	5	62.5%	13	81.3%	7	33.3%	0.02
dyslipidemia		3	60.0%	5	62.5%	14	87.5%	4	19.0%	0.001
Smoking		2	40.0%	3	37.5%	12	75%	4	19.0%	0.02
Obesity		3	60.0%	7	87.5%	6	37.5%	6	28.6%	0.08
Clinical presentation										
	ACS	0	0.0%	0	0.0%	0	0.0%	1	4.8%	0.7
	CSA	5	100.0%	8	100.0%	16	100.0%	20	95.2%	
Mode of treatment										
	PTCA	3	60.0%	0	0.0%	6	37.5%	0	0.0%	0.02
	PTCA &DES	2	40.0%	8	100.0%	10	62.5%	21	100%	

The classification of coronary angiography findings after one year of PCI was shown in figure (1):-Late ISR in five patients (10%), new stenosis in eight patients (16%), Combined ISR and new stenosis in sixteen patients (32%), Normal angiography in twenty one patients (42%) and new alone plus ISR and new stenosis in twenty four patients (48%)

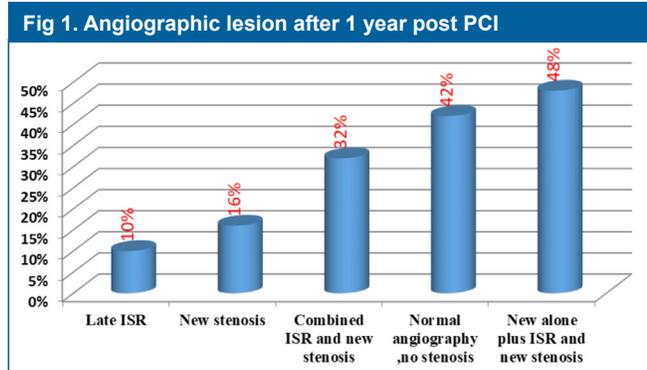


Table 3 LAD artery was most involved in seventeen (17/29) (58.6 %) of the patients which is statistically significant (P. value 0.02).

Table 3. Distribution of coronary lesion on 3 major vessels			
	ISR +with or without new lesion(n=29)	%	p-value
LAD	17	58.6	0.02
RCA	9	31.0	
LCX &LAD	2	6.9	
LCX	1	3.5	

Twenty of twenty-four (83.7 %) patients with either new stenosis or Combined ISR and new stenosis had multiples risk factors which is statistically significant (P. value 0.03), table 4.

Table 4. Relation of new lesion and number of risk factor

	No.	%	p-value
Single risk factor	4	16.7	0.03
Multiple risk factors	20	83.7	
Total	24		

Relation of risk factors and development of new lesion after 1 year post PCI. Nineteen dyslipidemic patients (19/24) (79.1%) had new lesion with or without ISR was highly statistically significant (P. value 0.01). twenty two (22/24) (91.6%) of the patients who had new lesion with or without ISR had DM was significantly (P. value 0.03). Both HT and smoking(75%),(62.5%) respectively had same statistically significant (P. value 0.04). thirteen of the patients (13/24) (54.1%) who had obesity show no statistically significant (P. value 0.06) correlation in development of new lesion. All results were summarized in Table 5.

Table 5. Relation of risk factors and development of new lesion after 1 year post PCI

	New lesion with or without ISR(n=24)	No lesion at all (n=21)	p-value
DM	22 (91.6%)	9 (42.8%)	0.03
Dyslipidemia	19 (79.1%)	7 (33.3%)	0.01
HTN	18 (75%)	10 (47.6%)	0.04
Smoking	15 (62.5%)	6 (28.5%)	0.04
Obesity	13 (54.1%)	8 (38.1%)	0.06

Late ISR was excluding

Hypertension was the predominant risk factor (82.0%) in the National Cardiovascular Data Registry (NCDR) registry followed by diabetes mellitus (36.0%)⁴¹. In the Swedish Coronary Angiography and Angioplasty Registry (SCAAR) registry the mean age was 67 years⁴². In Prashanth P et al⁴³ study the mean age was 58.2±11.2 years. In our study the male were (74.3%), the female were (25.7%), the predominant risk factor was dyslipidemia (66.8%) followed by HTN (55.1%) then DM (45.9%) and smoker (20%), our study, in ICHD mean age was 59.1±11.3 patients 78% age ≥45y and 54% male. DM was the predominant risk factor (91.6%) followed by HTN (56%) and dyslipidemia (52%) This was not accordance with the study done by Prashanth P et al⁴² and the NCDR registry⁴¹. In the NCDR, approximately 70.0% had ACS at presentation⁴¹. In the SCAAR, ACS was the reason for 78.0% of PCI⁴². The study done by Prashanth P et al, approximately (30.7%) had ACS at presentation, and (24.1%) of the patients had CSA⁴³. In our study, 95.2% of reangiography of the patients had CSA, that varies from data from the Western registry. This discrepancy may be attributed to the high number of ACS patients attending immediate PCI in the US and European Registries, the lack of primary PCI output at our Institute, and the lack of catheterization facilities accessible at peripheral hospitals for patients with thrombolysed STEMI moved to our PCI Institute. Pereira H et al and Papaioannou GI et al, study, DES were used in about 75.0% of patients^{44,45} while in Prashanth P et al study there was 88.4%⁴⁶. In our study 82% DES used This is due to the only type available in the our hospitals and market. Atherosclerosis of coronary arteries is a common phenomenon seen to be prevalent worldwide. Similar to our study of analytical study conducted in India, in which 350 adult patients having mean age range between 40-60 years referred to diagnostic catheterization on suspicion for coronary artery disease, lesion in coronary arteries revealed that out of 213 cases showing the occlusion, the most common artery to show a block was LAD 162 (76%), followed by RCA 92 (43%). The least common vessel to show an occlusive lesion was left main coronary artery (LMCA)⁴⁷.

The left anterior descending artery (LAD) is the most commonly involved vessel in coronary atherosclerosis. In our study, LAD was the most common artery involved in 17 (58.6%) followed by the RCA 9 (31%). This was in accordance with the study done by Chen Shao Liang⁴⁸ which also showed the LAD to be the most commonly involved vessel in occlusive lesion 54(40.9%) followed by RCA 51(38.6%). A similar view was shared by J Golshah⁴⁹ who found most lesions to be located in LAD (19.6%) followed by the RCA (13.7%).

The anterior descending artery has been considered as the artery most frequently and severely affected by the atherosclerotic process. However the study done by G G Gensini⁵⁰ showed the RCA to be most commonly involved vessel by the occlusive lesion 91(91%) followed by LAD 83(83%). Our study consistent with result of the study by Roever. L et al on the association of DM and atherosclerosis demonstrate that Insulin resistance (the hallmark of type 2 diabetes mellitus) A cluster of diseases (dyslipidemia, hypertension, obesity, glucose resistance, metabolic syndrome and endothelial dysfunction) are linked with metabolic and cardiovascular disorders, each of which is an individual risk factor for cardiovascular disease and demonstrate that food, exercise and drug treatment mobilizes fat from tissues, contributing to enhanced insulin sensitivity, enhanced functioning of beta cells⁵¹.

A study by Robert H et al the apolipoprotein localization in human cranial, extra cranial arteries, coronary arteries and the aorta, 35 patients the outcome were 65% of the plaque and 67% of fatty streaks demonstrated superposition of apolipoprotein and lipids suggest the impact of hyperlipidemia on progression of atherosclerosis⁵².

Conclusions

After one year from PCI there was high frequency of recurrence of symptoms exceeding half of the patients, most of them due to development of new lesion.

Recommendations

Strict control for dyslipidemia status post intervention is recommended

We should plan further study in large sample size of patients.

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