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Comparison of Usefulness of Percutaneous Coronary Intervention Guided by Angiography plus Computed Tomography versus Angiography Alone and its Impact on Instent Restenosis

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ABSTRACT

Background: optimal stent selection and placement would be expected to improve clinical outcomes. Coronary computed tomography angiography (CCTA) may permit better preprocedural planning.

Objectives: to assess the impact of incorporating coronary computed tomography angiogaphy guidance in defining reference value for stent length and diameter on angiographic and clinical outcomes in comparison to quantitative coronary angiography and its effect on incidence of instent restenosis.

Methods: the study was conducted on 153 diabetic patients with stable coronary artery disease. Patients were divided into two groups: group A and group B according to PCI guidance either with quantitative computed tomography angiography (QCTA) datasets or quantitative computed tomography (QCA) datasets respectively. Follow up clinically for six months to assess incidence of major adverse cardiac events (MACE) and angiographically by coronary angiography at six months or before if clinically indicated to assess incidence of instent restenosis (primary end point).

Results: QCTA was associated with longer lesions (p=0.001) and larger reference vessel diameter (p=0.001) than that measured by invasive QCA in group A. No statistical significant difference between group A and group B regarding restenosis rate, minimum lumen diameter at follow up and incidence of MACE.

Conclusions: CCTA guided percutaneous coronary intervention (PCI) is a safe and effective strategy for treatment of coronary artery disease however it didn't add a beneficial role in reducing incidence of instent restenosis or MACE in comparison to angiographic guidance alone.

Key words: CCTA, PCI, instent restenosis

INTRODUCTION

Percutaneous coronary intervention (PCI) and stent selection are unique to each lesion being considered, taking into account the true vessel size of the nearby normal reference segments, the likely lesion length, as well as plaque composition. The choice of stent diameter can be variable and somewhat forgiving, as smaller stents can, within reason, be dilated to a larger size. However, undersizing and oversizing stent diameters may lead to instent restenosis or vessel rupture, respectively. Also, undersizing stent length may lead to coronary dissection as well as residual exposed plaque, both of which subsequently require further stenting accompanied by the inherent increased risks associated with multiple stent implantations [1].

Coronary computed tomography angiography (CCTA) is able to visualize the lumen in any dimension and can characterize plaque and the coronary artery wall morphology. It may provide a more accurate estimation of the vessel wall diameter and lesion length, potentially allowing for more accurate stent size selection. This could result in less size mismatch between the stent and vessel wall and allow optimal placement of the stent margins in relatively disease free segments. Although intravascular ultrasound (IVUS) can also provide some of this information, it is associated with increased cost, a small increased risk of adverse events, and longer procedural time, all of which limit its routine clinical use [2].

Therefore, it seems reasonable that lesion characteristics obtained with coronary CT angiography, if available before invasive angiography, would be a surrogate for a preprocedural IVUS examination and would help with PCI planning [3].

Instent restenosis is a common complication after implantation of coronary artery stents,

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occurring in 20%–35% of bare metal stents (BMS) and 5%–10% of drug eluting stents (DES) [4-5].

Aim of the study: To assess the impact of incorporating coronary computed tomography angiogaphy guidance in defining reference value for stent length and diameter on angiographic and clinical outcomes in comparison to quantitative coronary angiography and its effect on incidence of instent restenosis.

PATIENTS AND METHODS

Patients: The study was conducted on 153 diabetic patients with stable coronary artery disease presented to cardiac catheterization laboratory at National Heart Institute and Sheikh Zayed Specialized Hospital in the period from December 2013 to June 2016. Patients were divided into two groups: group A and group B according to PCI guidance either with CCTA datasets or QCA datasets respectively. The study was approved by the local ethics committee. All participating patients signed informed consent.

Inclusion criteria:

Presence of ≥ 1 single significant (>70% stenosis) at the proximal segments of the coronary arteries likely to undergo PCI within 1 month based on CCTA or QCA datasets in defining reference value for stent length and diameter in diabetic patients.

Exclusion criteria:

Patients having one or more of the following criteria were excluded from the study:

1- Heavy calcification: CT calcium score > 900.
2- Atrial fibrillation or other significant arrhythmia.
3- Renal insufficiency (creatinine > 1.7mg/dl).
4- Long term total occlusions.
5- Contraindication to contrast or radiation exposure.
6- Non diabetic patients.

Methods

- All patients were subjected to the following:

1) Full history taking including: age, gender, risk factors for ischemic heart disease (diabetes mellitus, hypertension, smoking, dyslipidemia and family history), previous myocardial infarction, previous PCI and drug history especially antidiabetic therapy (dietary therapy, oral hypoglycemic drugs or insulin).

2) Clinical examination:

- General examination: For vital signs, decubitus and neck veins.
- Chest examination: to rule out patients with reactive airways.
- Local cardiac examination.

3) Electrocardiogram (ECG):

Twelve lead surface ECG was recorded before and after PCI:

• To localize the site of new infarction or ischemia if present.
• To detect any arrhythmia.

4) Laboratory investigations:

a) Kidney function tests (serum urea and creatinine).
b) Lipid profile (serum cholesterol, LDL, HDL and triglycerides).

B) Coronary computed tomography angiography (CCTA):

• Heart rate control: Target heart rate was 65 beats per minute prior to image acquisition with the use of beta blockers or calcium channel blockers if needed.
• Scan was acquired with a dual source 64 multidetector computed tomography (MDCT) scanner (Somatom Definition, Siemens, Forchheim, Germany) using the ECG gated acquisition during a single breath hold.
• Coronary calcium score was assessed using Agatston Score [6].
• 50 ml non ionic iodine containing contrast (at 5-6 ml/sec.) was used followed by 50 ml of saline at the same rate using a double head injector.
• ECG gated reconstructions were done in the diastolic phase (75% of the R-R interval). The whole coronary tree was reviewed for motion artifacts, if there were any, other phases of reconstruction were done including systolic phase. The data sets were reconstructed at a slice thickness of 0.6 mm with 0.3 mm increments.
• Coronary anatomy was assessed using the standard 17 segment American Heart Association (AHA) model of the coronary tree [7].
• Curved and straightened multiplanar reformation images were constructed and evaluated.
• CT data were transferred to a post processing workstation (syngo.via VA30, Siemens, Forchheim, Germany) for further analysis.
• Measurements were performed in the portion of the artery with the least amount of artifact.

• Maximum lumen diameters were measured immediately proximal and distal to the lesion at sections free of atherosclerotic plaque.
• The lesion length was measured at the point where the vessel became normal proximally and distally. Percent diameter stenosis was also measured.
• Preliminary treatment strategy was established including stent length and diameter.

C) Invasive coronary angiography and stent placement:

1) Invasive coronary angiography was performed using the standard technique.
2) Number of vessels affected was collected. Coronary artery lesion morphology before PCI was classified as A, B_1, B_2 or C according to the commonly accepted scheme of ACC/AHA [8].
3) The coronary artery lesion length, reference vessel diameter, minimal lumen diameter, percent diameter stenosis were assessed by QCA (Quant Cor QCA, Siemens Medical Systems, Germany) using the contrast filled guiding catheter as a calibration reference. The two best orthogonal projections were chosen on which lesion length measurements were performed to minimize foreshortening.
4) Stent length & diameter were selected according to either CCTA or QCA datasets depending on the patient group.
5) Bare metal stents were used. Predilatation if needed and maximal deployment pressure were recorded.
6) Reference vessel diameter (RVD), minimal lumen diameter (MLD), percent diameter stenosis (% DS) were assessed by QCA after PCI.
7) Angiographic success was defined as residual diameter stenosis < 20% and the ultimate achievement of thrombolysis in myocardial infarction (TIMI) flow grade 3.
8) Immediate angiographic results were assessed:
a) TIMI flow.
b) Adverse angiographic results:
Stent edge dissection, slow flow, abrupt closure, perforation, macroscopic embolization, side branch occlusion.
9) All patients were followed up during hospital stay for major adverse cardiac events (MACE).

D) Follow up:

Patients were assessed within 6 months after PCI for MACE defined as the composite of

- Death: include all fatal events, irrespective of the cause.
- Myocardial infarction: defined by new pathological Q waves on ECG or by an increase of serum creatine kinase to more than twice the normal values with a pathological elevation of myocardial isoenzyme concentration.
- Target lesion revascularization (TLR) through either percutaneous coronary intervention or coronary artery bypass grafting.

Follow up was performed through clinical visits. Patients were asked about the occurrence of ischemic symptoms e.g. chest pain with details of its character, duration, frequency and requirements of nitrates per day or per week. Patients were examined clinically e.g. vital data, cardiac examination.

End Point:

The primary endpoint was binary instent restenosis. All patients underwent invasive coronary angiography after 6 months or before if indicated to detect incidence of instent restenosis defined as the diameter stenosis more than 50% occurring inside stent or 5 mm on either side of the stent. RVD, MLD, % DS, and late loss were measured.

Table 1: Main parameters obtained with QCA [9].

Parameter	Meaning
MLD	The smallest lumen diameter in the segment of interest
RVD	The averaged diameter of the coronary assumed with-out atherosclerotic disease
DS	(RVD-MLD)/RVD
Late loss	Post procedural MLD—MLD at follow up

Data Management and Analysis:

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science **((IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp).** Data was presented and suitable analysis was done according to the type of data obtained for each parameter.

Descriptive statistics:

1. Mean ± Standard deviation (SD) and range for parametric numerical data, while Median and Interquartile range (IQR) for non parametric numerical data.

2. Frequency and percentage of non-numerical data.

ii. Analytical statistics:

1. Student t- test: was used to assess the statistical significance of the difference between two study group means.

2. Mann Whitney test (U test): was used to assess the statistical significance of the difference of a non parametric variable between two study groups.

3. Chi-Square test: was used to examine the relationship between two qualitative variables.

4. Fisher's exact test: was used to examine the relationship between two qualitative variables when the expected count is less than 5 in more than 20% of cells.

5. Logistic regression: useful in the prediction of the presence or absence of an outcome based on a set of independent variables. It is similar to a linear regression model but is suited when the dependent variable is qualitative (categorical).

RESULTS

Coronary computed tomography angiography data in group A:

The mean lesion length was 22.08 ± 5.67 mm, mean reference diameter was 3.22 ± 0.31 mm and the mean lesion severity was 81.18 ± 11.57 %. The mean calcium score was 100.5 ± 82.55, minimum of zero and maximum of 294. The mean time between CCTA and PCI was 21.25 ± 6.67 days, minimum of 6 days and maximum of 31 days.

Comparison between quantitative computed tomographic angiography (QCTA) and quantitative coronary angiography (QCA) results in group A:

a) Lesion length:

Lesion length measured by QCTA was significantly longer than that measured by QCA being (22.08 + 5.67 mm versus 20.34 + 5.78 mm, p = 0.001).

b) Reference vessel diameter:

Reference vessel diameter measured by QCTA was significantly larger than that measured by QCA being (3.22 + 0.31 mm versus 3.1 + 0.31 mm, p = 0.001).

c) Lesion severity:

There was no statistically significant difference between QCTA and QCA in assessment of lesion severity being (81.18 ± 11.57 % versus 81.14 ± 10.75 %, P = 0.96)

Comparison between group A and group B as regard demographic and clinical data

There was no statistically significant difference between the two groups regarding baseline demographic and clinical characteristics including age (55.52 versus 55.95 years, P = 0.781), gender (71.7% male, 28.3% female versus 63.3% male, 36.7% female, P = 0.330), hypertension (58.3% versus 53.3%, P = 0.581), glycemic status (65% NIDDM, 35% IDDM versus 60% NIDDM, 40% IDDM), smoking (38.3% versus 48.3%, P = 0.509), dyslipidemia (55% versus 41.7%, P = 0.144), positive family history (28.3% versus 23.3%, P = 0.532), prior MI (13.3% versus 16.7%, P = 0.609), history of PCI (5% versus 13.3 % , P = 0.114).

Comparison between group A and B regarding procedural data

There was no statically significant difference between the two groups regarding the interventional data including stent length (23.58 ± 8.04 mm versus 22.51±5.64 mm, P = 0.354) and stent diameter (3.02 ± 0.29 mm versus 3.03 ± 0.30 mm, P = 0.860), While there was a significant difference between the two groups regarding maximal balloon inflation pressure which was relatively higher in group A (14.09 ± 2.41 versus 12.07 ± 2.57 atm, P = 0.0001).

There was no statistically significant difference between the two groups regarding procedural outcome data including direct stenting (75% versus 63.4%, p = 0.127) and TIMI flow post PCI (TIMI III: 98.7% versus 100%, p = 1.0). There was no statistically significant difference in terms of procedural complications between the two groups.

Comparison between group A and B as regard angiography findings at the initial procedure

There was no statistically significant difference between the two groups initially before the procedure regarding lesion length (20.34 ± 5.78 mm versus 22.01 ± 5.54 mm, p = 0.075), baseline reference vessel diameter (3.10 ± 0.31 mm versus 3.15 ± 0.31 mm, p = 0.353). However, the lesion percentage stenosis was significantly lower in group A being (81.14 ± 10.76 % versus 86.34 ± 5.83 %, p = 0.001) and the baseline MLD was significant higher in group A (0.53 ± 0.22

mm versus 0.43 ± 0.20 mm, p = 0.004). However no significant difference between both groups regarding type of lesion (p = 0.798).

At the end of the procedure, there was no statistically significant difference in MLD (2.66 ± 0.30 mm versus 2.61 ± 0.29 mm, p = 0.342) and lesion percentage stenosis (7.39 ± 3.74 % versus 8.08 ± 3.89 %, p = 0.272)

Comparison between group A and B regarding clinical follow up findings

There was no statistically significant difference between the two groups regarding the recurrence of angina pain (35% versus 38.3%, p = 0.705). Regarding the incidence of MACE (defined as the composite of death, MI and TLR), there was no statistically significant difference between the two groups (p = 0.921).

Comparison between group A and B regarding angiographic follow up findings

There was no statistically significant difference between group A and group B regarding lesion percentage stenosis (37.94 ± 36.54 % versus 37.98 ± 38.39 %, p = 0.966), MLD (1.76 ± 1.06 mm versus 1.75 ± 1.10 mm, p = 2.27) and late loss (0.89 ± 1.02 mm versus 0.86 ± 1.08 mm, p = 0.882).

There was no statistically significant difference between group A and group B regarding the incidence of binary restenosis (31.1% versus 33.3%, p = 0.773) and incidence of denovo lesions (6.8% versus 6.9, p = 1).

TABLES AND FIGURES

Table 2: Comparison between group A and group B regarding their demographic and clinical data

Characteristics		GROUP				p-value	Significance
		Group A		Group B			
		Number	%	Number	%		
Gender	Male	43	71.7%	38	63.3%	0.330**	NS
	Female	17	28.3%	22	36.7%		
Hypertension	Yes	35	58.3%	32	53.3%	0.581**	NS
	No	25	41.7%	28	46.7%		
DM	NIDDM	39	65.0%	36	60.0%	0.572**	NS
	IDDM	21	35.0%	24	40.0%		
Smoking	None	26	43.3%	23	38.3%	0.509**	NS
	Current	23	38.3%	29	48.3%		
	Former	11	18.3%	8	13.3%		
Dyslipidemia	Yes	33	55.0%	25	41.7%	0.144**	NS
	No	27	45.0%	35	58.3%		
Family History	Yes	17	28.3%	14	23.3%	0.532**	NS
	No	43	71.7%	46	76.7%		
Previous MI	Yes	8	13.3%	10	16.7%	0.609**	NS
	No	52	86.7%	50	83.3%		
Previous PCI	Yes	3	5.0%	8	13.3%	0.114**	NS
	No	57	95.0%	52	86.7%		

**Chi-Square Tests

Table 3: Comparison between group A and B regarding procedural data

	GROUP				p-value	Significance
	Group A		Group B			
	Mean	±SD	Mean	±SD		
Stent Length	23.58	8.04	22.51	5.64	0.354‡	NS
Stent Diameter	3.02	0.29	3.03	0.30	0.860‡	NS
Ballon Pressure	14.09	2.41	12.07	2.57	0.0001‡	HS

‡Student t test

Table 4: Comparison between group A and B regarding procedural outcome data

		Number	%	Number	%	p-value	Significance
Pre-dilatation	Yes	19	25.0%	26	36.6%		
	No	57	75.0%	45	63.4%	0.127*	NS
TIMI Flow	III	75	98.7%	71	100.0%		
	I	1	1.3%	0	0.0 %	1.0**	NS
Adverse Events	None	72	94.7%	68	95.8%		
	Dissection	3	3.9%	1	1.4%		
	Side Branch occlusion	1	1.3%	1	1.4%	0.741**	NS
	Slow flow	0	.0%	1	1.4%		

*Chi-Square Tests
**Fisher exact test

Table 5: Comparison between group A and B regarding angiography findings at the initial procedure

	GROUP				p-value p- value	Significance Significance
	Group A		Group B			
	Mean	±SD	Mean	±SD		
Baseline Parameters						
Lesion length	20.34	5.78	22.01	5.54	0.075‡	NS
RVD	3.10	0.31	3.15	0.31	0.353‡	NS
Severity of lesion	81.14	10.76	86.34	5.83	0.001‡	HS
Pre MLD	0.53	0.22	0.43	0.20	0.004‡	HS
Parameters at end of procedure procedure						
Post Procedure RVD	3.23	0.32	3.19	0.32	0.461‡	NS
Post Procedure DS%	7.39	3.74	8.08	3.89	0.272‡	NS
Post Procedure MLD	2.66	0.30	2.61	0.29	0.342‡	NS

‡Student t test
**Chi-Square Tests

Table 6: Comparison between group A and B regarding clinical follow up findings

		GROUP				p-value	Significance
		Group A		Group B			
		Number	%	Number	%		
Angina	Yes	21	35%	23	38.3%		
	No	39	65%	37	61.7%	0.356*	NS
MACE	None	37	61.7%	38	63.3%		
	Death	1	1.7%	2	3.3%	0.921**	NS
	MI	2	3.3%	1	1.7%		
	TLR	20	33.3%	19	31.6%		
Revascularization	PCI	17	28.8%	17	29.3%		
	CABG	5	8.5%	3	5.2%	0.869**	NS
	Medical ttt	37	62.7%	38	65.5%		

*Chi-Square Tests
**Fisher exact test

Table 7: Comparison between group A and B regarding QCA follow up findings

	GROUP						p-value	Significance
	Group A			Group B				
	Mean	±SD	Median	Mean	±SD	Median		
RVD	3.17	0.31	3.15	3.19	0.31	3.15	0.744‡ 0.744‡ 00.744‡	NS
MLD	1.76	1.06	2.19	1.75	1.10	2.27	0.994‡‡	NS
ISR%	37.94	36.54	20.30	37.98	38.39	13.20	0.966‡‡	NS
Late Loss	0.89	1.02	0.43	0.86	1.08	0.08	0.882‡‡	NS

‡student t test
‡‡Mann whitey test

Table 8: Comparison between group A and B regarding restenosis rate and incidence of denovo lesions

		Group A		Group B		p-value	Significance
		Number	%	Number	%		
ISR Significance	**<50 %(n %)**	**51**	**68.9%**	**46**	**66.7%**	**0.773***	**NS**
	≥50 %(n %)	**23**	**31.1%**	**23**	**33.3%**		
Denovo lesion	**Yes (n %)**	**4**	**6.8%**	**4**	**6.9%**	**1.0****	**NS**
	No (n %)	**55**	**93.2%**	**54**	**93.1%**		

*Chi-Square Tests
**Fisher exact test

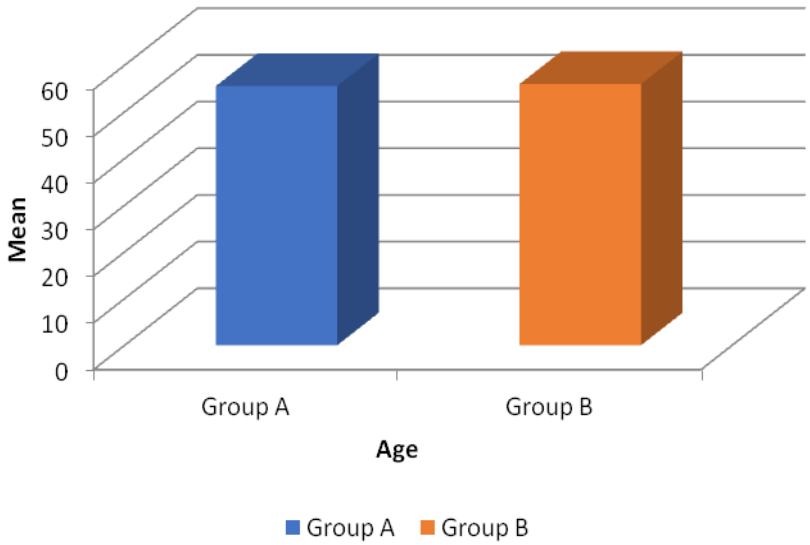

Figure 1: Comparison between group A and group B regarding their age

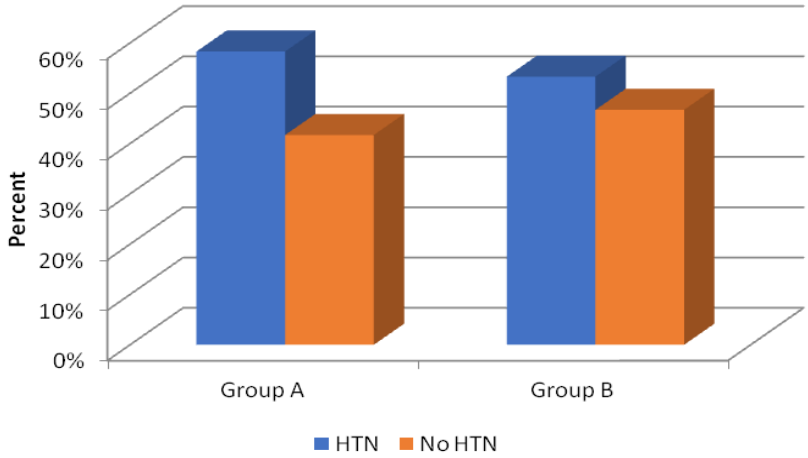

Figure 2: Comparison between group A and group B regarding hypertension

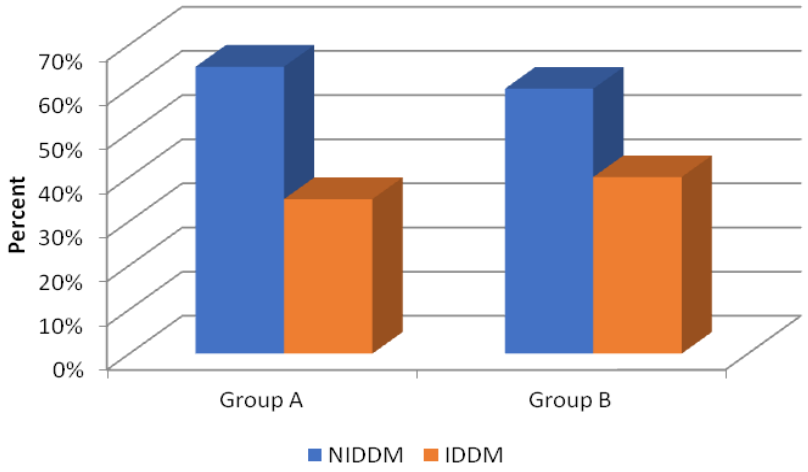

Figure 3: Comparison between group A and group B regarding their diabetic status (insulin dependent or not)

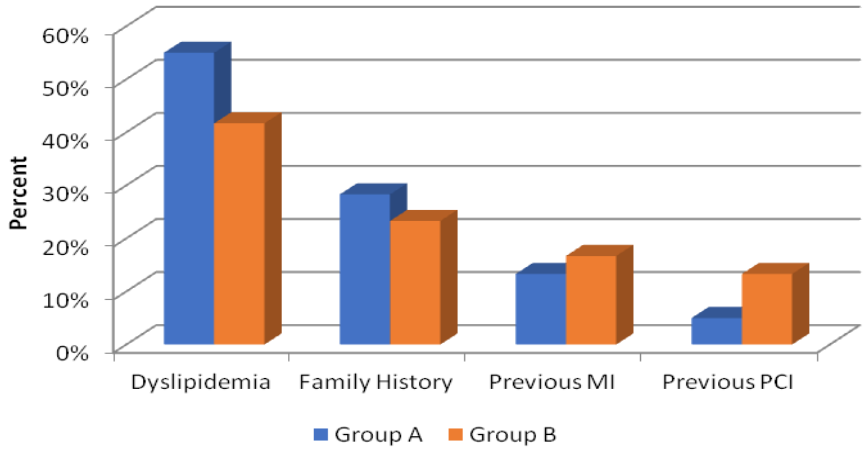

Figure 4: Comparison between group A and group B regarding other clinical variables (dyslipidemia, family history, previous MI, previous PCI)

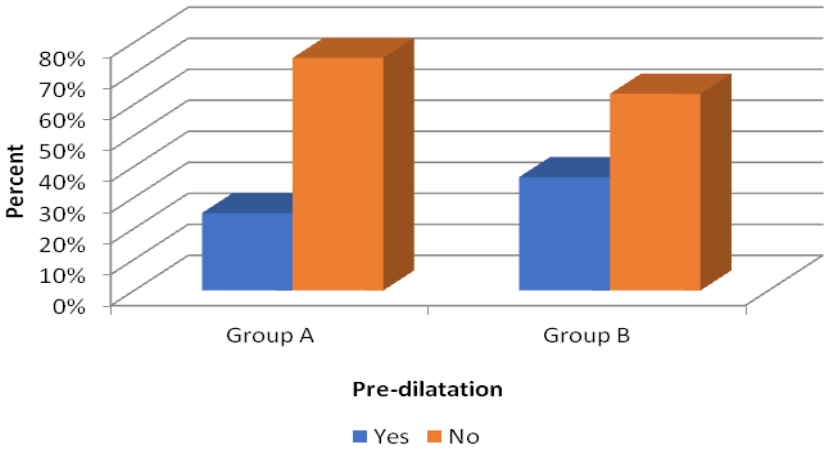

Figure 5: Comparison between group A and group B regarding the use of balloon predilatation

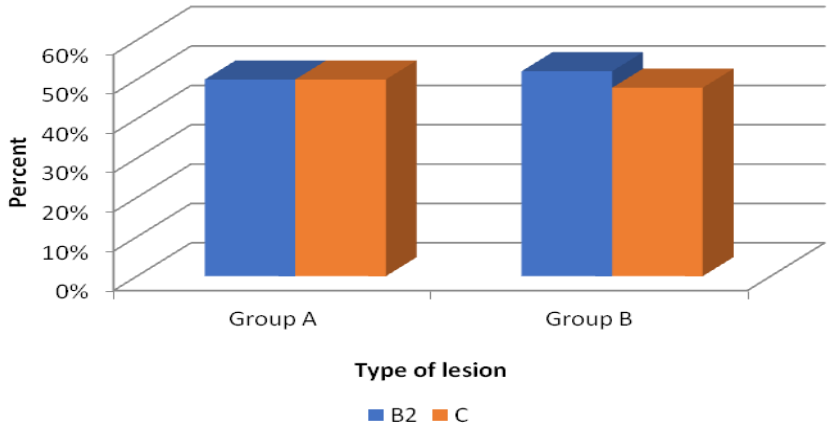

Figure 6: Comparison between group A and group B regarding type of lesion at angiography

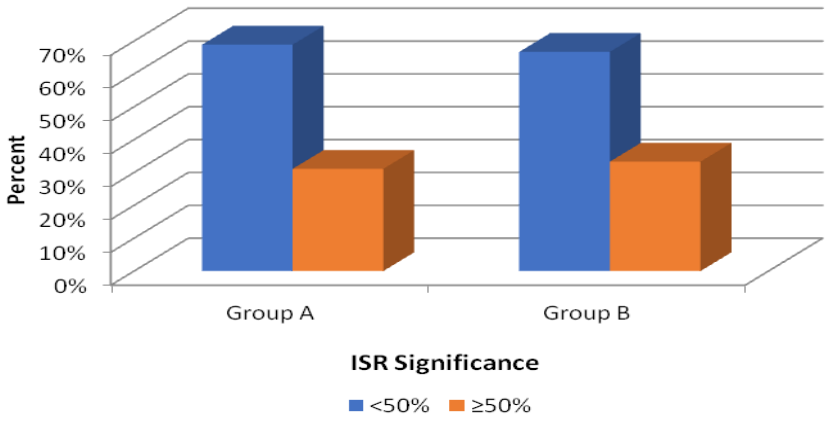

Figure 7: Comparison between group A and group B regarding the rate of instent restenosis

DISCUSSION

Accurate sizing of stents used during percutaneous coronary intervention is essential to avoid late stent thrombosis that may result from under expansion or mal position. The rapid development of accurate coronary computed tomographic angiography offers a non invasive alternative, which is not plagued by the two-dimensional lumen assessment and limited sampling nature of standard coronary angiography [10].

Optimal stent selection and placement would be expected to improve clinical outcomes, suggesting a potential role for incorporation of CCTA data when planning PCI procedures, when it is available. CCTA may permit better preprocedural planning, which could reduce the duration of the invasive coronary angiography(ICA) procedure and the need for multiple angiographic injections, potentially reducing radiation exposure and contrast use and associated complications such as nephrotoxicity [3].

In the present study, QCTA tended to overestimate lesion length compared to QCA (22.08 $\pm$ 5.67 vs 20.34 $\pm$ 5.78 mm, p = 0.001).

This result was concordant with that of ***de Silva et al.*** [11] in a study that included 248 patients with 352 lesions underwent PCI within 4 months after CCTA where stent sizing by CCTA was compared with that deployed based upon conventional coronary angiography. They showed that the median predicted CTA stent length was significantly longer (20 vs 18 mm, p < 0.0001) than those deployed during PCI.

The difference between ICA and CTA lesion length assessment can be explained by the excellent ability of CTA to visualize plaque and vessel remodelling in the arterial wall, in contrast to ICA. ICA only shows the contrast filled lumen and is unable to visualize the arterial wall (with the exception of large calcifications). Moreover, CCTA is not hindered by limitations of angiographic projection such as foreshortening or difficulties in case of tortuous vessels. The ability of CCTA to characterize the vessel wall, plaque, and coronary calcium may provide improved lesion length estimation.

In the present study, reference vessel diameter was significantly larger by QCTA than QCA (3.22 $\pm$ 0.31 vs 3.1 $\pm$ 0.31 mm, p = 0.001).

This result was concordant with that of ***LaBounty et al.*** [3] in their study which included 18 patients with 24 lesions underwent PCI. They found that the final stent diameters were larger with CCTA compared to ICA both at the proximal end (3.6 $\pm$ 0.5 vs 3.1 $\pm$ 0.5 mm. p < 0.001) and distal end (3.2 $\pm$ 0.6 vs 2.9 $\pm$ 0.4 mm, p = 0.004). In contrary to this result, ***de Silva et al.*** [11] found in their study that the predicted CTA stent diameter was smaller and statistically significant (3.0 vs 3.2 mm, p < 0.0001) than the stent diameter deployed at PCI.

Stent diameter assessment by CCTA may reduce the size mismatch observed in longer lesions, provide information that determines whether a lesion is suitable for direct stenting without predilatation and may enable the operator to avoid the deployment of stents that are larger than the reference vessel, which may induce more trauma to the vessel and, therefore, more intimal hyperplasia, edge dissections, and coronary ruptures[12].

In the present study, maximal balloon inflation pressure in group A was statistically higher than that in group B (14.09 $\pm$ 2.4 vs 12.07 $\pm$ 2.57 atm, p = 0.0001) with the resultant larger post procedure MLD in group A than group B that didn't reach statistical significant difference (2.66 $\pm$ 0.3 vs 2.61 $\pm$ 0.29 mm, p = 0.342), no significant difference in stent diameter (3.02 $\pm$ 0.29 vs 3.03 $\pm$ 0.3, P = 0.86) and ending the procedure in both groups by few adverse angiographic events (5.2% vs 4.2%, p = 0.741).

These results were concordant with those obtained by ***Pregowski et al.*** [13] in which they found that maximal balloon pressure was significantly increased in the ACTG group versus the AG group (17 $\pm$ 3 vs 15.5 $\pm$ 2.7 atm, p = 0.04). Minimal stent area (measured by IVUS) tended to be larger in the ACTG group (6.64 $\pm$ 2.01 vs 5.80 $\pm$ 2.02 mm², p = 0.1) as was mean stent area (7.81 $\pm$ 2.15 vs 6.86 $\pm$ 1.93 mm², p = 0.07). They postulated that more aggressive stent implantation in the ACTG group resulted in a trend toward a larger minimal stent area and better stent expansion (assessed by IVUS) than with angiographic guidance alone. They found also that no significant coronary complications occurred in the study population, especially in the more aggressively treated ACTG group.

To our knowledge, this is the first prospective study comparing the effect of using CCTA guidance versus angiographic guidance alone for stent size selection on angiographic and clinical outcome. The main finding of the present study was that PCI guided by CCTA for treatment of coronary artery disease (CAD) appears safe and effective with no increase in major in-hospital complications.

However, the present study failed to show a beneficial effect of the use of CCTA during coronary stenting over angiographic guidance alone. Namely, there was no significant difference in the angiographic outcome at 6 months follow up between group A and group B, which was the primary endpoint of the study (restenosis rate: 31.1% vs 33.3%, p = 0.773; MLD: 1.76 $\pm$ 1.06 vs 1.75 $\pm$ 1.1 mm, p = 0.994; late loss : 0.89 $\pm$ 1.02 vs 0.86 $\pm$ 1.08 mm, p = 0.882). In addition, no significant difference regarding the incidence of MACE between group A and group B (Death: 1.7% vs 3.3%; MI: 3.3% vs 1.7%; TLR: 33.3% vs 31.6%, p = 0.669).

This may be explained by the relatively small sample size, higher risk profile of the current study population with inclusion of patients with diabetes mellitus and more complex lesion morphology (type B_2 and type C lesions), factors reported to be predictive of stent restenosis. In addition, the potential increase in the vessel wall trauma may lead to more subsequent tissue formation counteracting the acute angiographic results and clinical outcome. Moreover, stent length was longer in group A (23.58 $\pm$ 8.04 vs 22.51 $\pm$ 5.64 mm, p = 0.34) however, it didn't reach a statistical significant difference.

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