Research Article

Complementary role of quantitative angiography in percutaneous intervention in complex lesion.

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Abstract

Background: Inadequate stent expansion is an important cause of future complications of percutaneous coronary intervention like ,stent thrombosis and restenosis. Stent Boost can help to improve stent visualization and evaluates stent expansion. **Aim of the study:** was to evaluate value of quantitative angiography imaging to detect insufficient stent deployment and improve stent expansion through comparison with the most reliable method for evaluation of stent deployment by using IVUS. **Patients and methods:** We evaluated quantitative angiography (QCA), SB and IVUS after implantation of 38 stents in 30 patients. more than 4.5 mm2. From June 2015 to June 2016, 30 patients (38 stents) were tested using QCA , SB and IVUS. We compared between imaging techniques in minimal stent diameter, maximum stent diameter and mean stent diameter using Pearson correlation and Bland–Altman scatter plot. **Results**: There was good correlation between Stent Boost and IVUS measurements regarding minimal stent diameter ($p < 0.001$ in all stent portions) while lesser agreement was found between IVUS and QCA. **Conclusion:** We can use QCA as complementary with stent boost method for detection of stent insufficient deployment in centers where IVUS not available.

Key words: Angiography, Cardiology, Intravascular ultrasound (IVUS), Percutaneous coronary intervention, Quantitative angiography (QCA), Stent Boost (SB).

Introduction

Clinical outcome after percutaneous coronary intervention in patient with acute coronary syndrome improved by using Coronary stents However, early or late thrombotic complications (acute/subacute/ late stent thrombosis) after coronary stent implantation remain a problem. These are associated with a high mortality[1,2]. SB imaging has been developed by a Philips Medical Systems based upon techniques that improve the radiologic edge of the stent, the stent edges are generally only very faintly visible, but by using this method, contour of the stent is obtained clearly.[8,9].

Aim of the study

Was to evaluate value of QCA method to detect insufficient stent deployment by comparison with the most reliable method by using IVUS.

Patients and methods

1- Study design:

This prospective, single-center cohort study included 30 patients with known obstructive coronary artery disease who undergone PCI in Apollo Gleneagles Hospital Heart Institute Kolkata from June 2015 till June 2016.

2- Study population:

Thirty patients who subjected to PCI in Apollo Gleneagles Hospital Heart Institute Kolkata from June 2015 till June 2016. **Criteria of inclusion:**► Patients aged 18 years old and a clinical indication for stent implantation. **Criteria of exclusion:**► Refusal to participate in the study.►Implantation of a stent for in-stent restenosis

3- Ethical consideration: All procedures were done in accordance with the ethical standards of the responsible committee on human experimentation .Informed consent was obtained from all patients who were included in the study.

Study protocol, StentBoost and IVUS were performed after stent deployment after results Quantitative analysis of angiography and quantitative StentBoost were only performed off-line post-procedure and didnt affect clinical care.

Data collection:
Clinical history, physical examination data, and data of a 12-lead ECG and Echo-cardiography (2D, M-mode, and Doppler) accessed from the study population as described above who gave consent for this study. The data was recorded in data sheet on first contact with the patients.

Quantitative Coronary Analysis
Acquisitions of all angiographic images were obtained with two digital flat-panel cardiac imaging system (Allura Xper FD 20 &10, Philips Medical Systems, The Nether-lands). QCA analysis was performed using a previously validated, commercially available semi-automated QCA package (Philips Medical Systems, Frames for QCA analysis was selected from fully opacified angiograms that provided optimal visuali-zation of the lesion-treated segment with the least degree of foreshortening. Calibration was performed with the use of the contrast-filled guidingcatheter as the reference. Post-PCI the maximal stent diameter, minimal stent diameter and the mean stent diameter were obtained.

Statistical Analysis
Data was presented as mean values and standard deviations for continuous variables. Differences between QCA, IVUS, and StentBoost measurements were compared using the Pearson product–moment correlation and Bland–Altman analysis. All analyses were performed using SPSS.

Results
This prospective, single-center cohort study included 30 patients with known obstru-ctive coronary artery disease who did PCI in Apollo Gleneagles Hospital Heart Institute Kolkata from one June 2015 till one June 2016. They included 27(90%) males and 3(10%) females with a mean age of 61.461.4±8.6 year (range 47-81).
Baseline characteristics are detailed in (Table 1).

A total of 38 lesions (Table 2) were stented and comprised 11.0% of the left main, 12.0% of the left anterior descending, 6.0% of the left circumflex/acute marginal branch and 5.0% of the right coronary artery. Of the 38 stents (Table 3) implanted, 44.7% Resolute ntegrity 28.9% Promous premier 13.2% Xience xpedation, 10.5% Endovear sprint and 2.5% Pronova .

The average stent (Table 5) diameter was 3.53±0.49mm, the stent length was 27.13± 10.9mm, and the deployed at a mean pressure of 13±1.63 atm. From 38 lesions, 57.4% were type7.9% were type B 68.4% and 23.7% were type C. (table. 2) respectively.

Table (1): Baseline characteristics of participant patients

Variable	Frequency N=(30)	Percentage N=(30)
Age (years)	47_81	61.4±8.6
Sex **Male** **Female**	 27 3	 90 10
HTN	23	76.7
DM	20	66.7
Dyslipidemia	19	63.3
FH of premature CAD	5	16.7
Smoking	20	66.7
Post GABG	20	6.7
Previous PCI	5	16.7

Table (6): In-stent measurements by intravascular ultrasound (IVUS), quantitative angiography (QCA) and Stent Boost. (anova)

	QCA N=(38)	IVUS N=(38)	SB N=38)	P-value
MSD	2.9±0.49	3.1±0.59	2.9±0.59	0.51
MXSD	3.9±0.71	4±0.76	3.8±0.77	0.56
Mean± SD	3.34±0.63	3.48±0.66	3.34±0.64	0.55

IVUS intravascular ultrasound, *MSD* minimal stent diameter, *MXSD* maximum stent diameter, *QCA* quantitative angiography, *SB* StentBoost
[a]MXSD − MSD/MXSD

Table (7): Comparison of measurements QCA , IVUS and stent boost

	R(P-value)	Mean difference
MXSD by IVUS versus Stent boost	0.84(0.001)	0.18±0.43
MXSD by IVUS versus QCA	0.89(0.001)	0.12±0.35
MSD by IVUS versus Stent boost	0.81(0.001)	0.14±0.42
MSD by IVUS versus QCA	0.69(0.001)	0.13±0.40
Mean SD by IVUS versus QCA	0.80(0.001)	0.14±0.40
Mean SD by IVUS versus stent boost	0.80(0.001)	0.14±0.41

Discussion

In contrast, QCA assessment quantifies luminal dimension following contrast coronary injection; however, it does not directly determine stent dimensions. Thus, QCA and Stent Boost provide additive information and constitute complementary imaging tools during PCI. Contrary to IVUS, the use of Stent Boost does not significantly prolong the procedure, since the insertion of an additional catheter is not needed and imaging acquisition is rather fast. Although Stent Boost requires additional X-ray exposure, this increment is minimal with respect to standard PCI and is not likely to be clinically relevant ,

Conclusion

We can use QCA method with stent boost for detection of stent in sufficient deployment in centers where IVUS not available or IVUS is not used routinely especially in cases with complex coronary anatomy.

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