

Incidence and Risk Factors for Coronary Stent Thrombosis at Al Shifa Hospital-Gaza Strip

Mais AlDahdooh¹, Amal AlKhashif¹, Mai AbdElAal¹, Alaa Qwaider¹, Mai ALAthannah¹, Mohammed Hussein Habib^{2*}

¹16th year medical student at Islamic University of Gaza

²Cardiologist, Ph. D, MD, Head of Cardiac Cath., Al-Shifa Hospital, Gaza

*Corresponding author: Mohammed Hussein Habib, Department of Head cardiology and cardiac catheterization, Ph.D. Cardiology, Al-Shifa Hospital, Palestine, Email: cardiomohammad@yahoo.com

Abstract

Background: Stent thrombosis (ST) is an infrequent but potentially fatal complication of PCI. As early identification and management of risk factors mostly implicated in development of stent thrombosis may help reduce its burden, this study was conducted to determine the prevalence of stent thrombosis and to evaluate which factors (patient and procedure-related factors) are mostly associated with ST.

Methods: A retrospective study was conducted on patients who underwent PCI with stent implantation at AL Shifa Hospital in Gaza Strip between January and December 2017. A sample of 249 patients (193 males and 56 females) was selected from 300 patients where the mean age was 59 ± 11 years. Data was collected and analyzed using SPSS.

Results: Of 249 patients treated with coronary stent implantation, 13 patients (5.2 %) presented with a definite ST. A total of 6 STs were acute, 3 were sub acute, 3 were late, and 1 was very late. Renal dysfunction, Diabetes mellitus, present malignant disease and previous PCI were the major clinical factors significantly associated with the occurrence of ST (with p-values of 0.051, 0.002, 0.004 and 0.038 respectively). Whereas the major lesion and procedure related factors were the ostial lesion, bifurcation lesion, coronary dissection and the presence of residual thrombus proximal or distal to the culprit lesion (with p-values of 0.022, < 0.001, 0.004 and 0.001 respectively).

Conclusions: Important correlates of ST were identified. Diabetes mellitus, renal dysfunction, present malignancy, previous PCI, complex lesion (ostial and bifurcation lesion), dissection of the coronary vessel and the presence of residual thrombus proximal or distal to the culprit lesion were found to be the major predictors of stent thrombosis.

Keywords: Fractured catheter; Port-a-cath; Embolization to heart

Introduction

Annually, approximately 3 million percutaneous coronary interventions (PCI) are performed worldwide. As a result, coronary stent -related complications, even when occurring at relatively low rate, have a major impact on total mortality and hospital stay. The most dreadful complication after coronary stenting is stent thrombosis (ST), which is the sudden occlusion of stented coronary artery due to thrombus formation^[1,2]. The rate of stent thrombosis at one year is about 1 % to 3 % and the yearly rate following one year is about 0.2 percent per year^[3-7]. The risk factors for ST can be divided into patient-related and procedure-related factors.

Patient-related factors include: discontinuation of antiplatelet therapy^[8-11]; lack of co prescription of statin therapy^[9,12] diabetes mellitus^[8,10,13]; renal dysfunction^[13,14]; present malignant disease^[8,10]; LVEF < 30%^[8,10,13]; younger age^[8,10,13]; prior PCI^[13]; current smoking^[9,12] and acute coronary syndromes (ACS)^[14,15] Procedure-related factors include: uncovered coronary dissection^[8]; under sizing; the presence of intermediate CAD proxi-

Received date: May 13, 2019

Accepted date: August 5, 2019

Published date: August 10, 2019

Citation: Habib, M.H., et al. (2019) Percutaneous Retrieval of Fractured Catheters from Pediatric Endovascular Tree: Case Series and Literature Review *J Heart Cardiol* 4(1): 12-15.

Copyright: © 2019 Habib, M.H. This is an Open access article distributed under the terms of Creative Commons Attribution 4.0 International License.

mal or distal to the culprit lesions^[8]; bifurcation lesion^[7,8,10]; total number of stents; small stent diameter^[7,15,16]; long total stent length^[8,10,14] and choice of stent, i.e., bare metal stents (BMS) or drug-eluting stents (DES)^[8,10].

In this study we sought to identify the predictors of ST in different population (stable angina, ACS) and in different use of BMS and DES.

Methods

Study design and population

This study was a retrospective analysis of clinical, angiographic, and procedural data for all patients treated with stent implantation for coronary artery disease at Al-Shifa hospital between January and December 2017.

Data collection

All patients who underwent PCI in the specified timeframe were identified. Demographic, clinical and angiographic data as well as antiplatelet therapy were collected from hospital records. Angiogram of patients that had ST was reviewed by Experian interventional cardiologist to identify the thrombus, coronary dissection, size of the stented vessel and other findings.

Renal failure was defined as creatinine level of > 200 µmol / L, chronic heart failure (CHF) as symptomatic heart failure with ejection fraction less than 30%, and cardiogenic shock as systolic blood pressure < 100 mmHg along with signs or symptoms of hypoperfusion.

The Academic Research Consortium (ARC) definitions of ST were used in this study. ARC divides ST into three categories: definite ST, defined as angiographically or pathologically confirmed ST with acute ischemic symptoms or ECG changes or rise in cardiac biomarkers; probable ST, defined as any unexplained death within 30 days of PCI or any myocardial infarction (MI) related to acute ischemia in the territory of the implanted stent without angiographic confirmation of stent thrombosis and in the absence of any other obvious cause; and possible ST defined as any unexplained death beyond 30days. We also categorized ST into ARC defined timescales: acute (intraprocedural or within 24 h of the procedure), sub acute (from 24 h to 30 days), late (< 30 days to 1 year), or very late (< 1 year).

Data analysis

Data entry and statistical analyses were performed using SPSS (Statistical Package for Social Sciences) software package version 25. Categorical data are presented as count and percentage and were compared using chi-square test.

Continuous variables are presented as mean ± SD and were analyzed using Student's-t test. All statistical tests were 2-sided, and differences were considered statistically significant at p value less than 0.05.

Results

During the study period, 300 patients underwent PCI with stent implantation at AL Shifa Hospital. Of these, 249 patients were included with a Median follow-up was 18 months (interquartile range 12-24 months).

The mean age was 59 ± 11 years; 77.5 % of the patients

were male and 43.8% were current smokers. 5.2% of the procedures were performed for stable angina, 94.4% of the procedures for ACS and 0.4% for stent thrombosis. At the time of index PCI, 2.8% of patients had cardiogenic shock.

Incidence of Stent Thrombosis

During a median follow-up of 18 months (12 to 24 months), 13 patients (5.2%) developed definite ST that were confirmed angiographically, one of them had two attacks of ST. The subdivision of definite ST cases into the ARC-defined timescales is given in Table 1.

Table 1: ARC-defined incidence of definite ST.

Definite ST	
Acute	6 (46.2%)
Sub acute	3 (23.1%)
Late	3 (23.1%)
Very late	1 (7.7%)

53.8% of stent thromboses presented as acute MI, 23.1% as unstable angina, 7.7% as Prinzmetal angina, and 15.3% as intraprocedural stent thrombosis (7.7% as death and 7.7% as no reflow phenomena).

Risk factors for Stent Thrombosis

Detailed clinical, procedural, and lesion characteristics comparing patients with and without ST are described in Table .2 and Table 3.

Table 2: Clinical characteristics

	Stent thrombosis (n=13)	No stent thrombosis (n=236)	p value
Age(years)	57.23+9	59.18+10.6	0.516
Male	12 (92.3%)	181 (76.7 %)	0.189
Diabetes mellitus	9 (69.2%)	90 (38.2%)	0.002
Hypertension	11 (84.4%)	175 (74.2%)	0.398
Renal dysfunction	3 (23.1%)	18 (7.6%)	0.051
CHF	1 (7.7%)	25 (10.6%)	0.739
Hyperlipidemia	0	10 (4.2%)	0.291
Current smoking	7 (53.8%)	102 (43.2%)	0.452
Previous stroke/TIA	0	5 (2.1%)	0.596
Malignancy	1 (7.7%)	1 (.4%)	0.004
Previous PCI	5 (38.5%)	38 (16.1%)	0.038
Previous CABG	1 (7.7%)	8 (3.4%)	0.418
Indication of stent :			0.916
-STEMI	10 (76.9%)	146 (61.8%)	
-NSTEMI/ unstable angina	3 (23.1%)	67 (28.6%)	
-Stable angina	0	13 (5.5%)	
-WELLENS syndrome	0	9 (3.8%)	
-stent stenosis	0	1 (.4%)	
Cardiogenic shock at presentation	1 (7.7%)	6 (2.5%)	0.274

Table 3: lesion and procedural characteristics

	Stent thrombosis (n=13)	No stent thrombosis (n=236)	p value
Target vessel:			0.06
- LAD	7 (50.4%)	119 (50.2%)	
- LCX	3 (23.1%)	48 (20.3%)	
- LM	1 (7.7%)	1 (.4%)	
- RCA	4 (30.8%)	79 (33.4%)	
- venous graft	0	1 (.4%)	
Ostial lesion	4/13(30.8%)	24 (10.2%)	0.022
Bifurcation lesion	3 (23.1%)	6 (2.5%)	less 0.001
Type of stent :			0.662
- BMS	8 (61.5%)	122 (51.7%)	
- BMS + DES2	0	9 (3.8%)	
0	5 (38.5%)	105 (44.5%)	
NO. of stent per patient	1.53+-.66	1.42+-.7	0.58
Minimal stent diameter (mm)	2.78+-.57	2.91+-1.4	0.767
Total Stent length (mm)	23.9+-4.3	21.9+-4.9	0.163
Coronary dissection	1 (7.7%)	1 (.4%)	0.004
Residual stenosis	8 (61.5%)	14 (5.9%)	Less .001

It was revealed that Renal dysfunction, DM, present malignant disease, previous PCI, ostial and bifurcation lesion, coronary dissection and the presence of residual thrombus proximal or distal to the culprit lesion were significant associated with the occurrence of ST. Eight (61.5%) stent thromboses were related to a BMS and 5(38.5%) stent thromboses were related to a DES. The cumulative incidence of ST was not significantly different between the 2 different types of coronary stents: p value 0.66.

Medical management after stent implantation

After exclusion of 7 patients from stent thrombosis group (6 acute ST and 1 died) and 7 patients from non-stent thrombosis group (6 died and 1 escaped), we evaluate the medical management of 236 patients after stent implantation.

Ninety-two percent of patients were prescribed dual antiplatelet therapy (DAPT) which, in the majority of cases (85.5%), consisted of aspirin and clopidogrel; only 6.7% of these received aspirin and prasugrel. 2.5% of patients were prescribed triple APT which consisted of aspirin, clopidogrel and prasugrel. The remaining 5% patients, who received single APT, received aspirin (1.6%) or clopidogrel (3.3%).

Detailed medical managements comparing patients in stent thrombosis group and non-stent thrombosis group are listed in Table 4.

Table 4: Medical management after stent implantation

	ST (n=7)	No ST (n=229)	P value
Antiplatelet therapy			0.695
-	DAPT	7(100%)	211(92.1%)
-	Triple APT	0	6(2.6%)
-	Single APT	0	12(5.2%)
Statin	7(100%)	214(93.4%)	0.341

Discussion

This study was conducted on 249 patients who underwent PCI with stent implantation and showed a 5.2% prevalence of definite stent thrombosis (46.2% acute, 23.1% sub acute, 23.1% late, 7.7% very late) among the study population and this was higher compared to other studies which were conducted in this topic. As in (the Dutch ST registry, 2009) during a median follow-up of 31 months, definite ST was present in 2.1% (32% acute, 41% sub acute, 13% late, 14% very late), which was significantly lower than what we found in our study.

The other study is^[16] during a median follow-up of 700 days, the rate of definite and probable ST was 1.9 % (73% acute or subacute, 11% late, 16% very late), which also was significantly lower than what we found.

Among the clinical factors, we concluded that occurrence of ST is associated most significantly with DM, previous PCI, renal dysfunction and malignancy, with less significant factors such as male gender, HTN, cardiogenic shock at presentation, STEMI -as indication of PCI- and current smoking, whereas the most significant predictors for ST as Dutch Registry revealed are presence of malignancy, DM, younger age and if the indication of stent implantation is unstable angina, NSTEMI and STEMI.

But the Dutch Registry had a very important result, which focused on the effect of clopidogrel discontinuation after PCI, they found that the lack of clopidogrel therapy in the first 6 months after stent implantation, especially in the first 14 days, is the strongest predictors of ST. Unfortunately, we didn't study that item in our study, we will study it in the future.

The same determinant was studied^[10] and the same result was found.

Smoking was significant factor in study^[9], but we found that it is not in our study population.

Among the lesion and procedure related factors, we found that the risk of ST was significantly high with ostial lesion, bifurcation lesion and if there is coronary dissection or residual stenosis, the same was found in (Dutch Registry, 2009^[16]). Type, length, diameter of stent were significant factors in Dutch Registry, but not in our study.

Study limitation

Several limitations of the present study need to be acknowledged: First, this is an observational study, with the data derived retrospectively from patient records at a single center only. So, the possibility of missing a ST in a patient who presented elsewhere cannot be excluded. Second, some aspects of the data were unconfirmed such as we did not evaluate patients' compliance with their antiplatelet treatment and our results are based on antiplatelet prescription only for some patients, echocardiogram was not done to identify left ventricular ejection fraction. for others, lipid profile was not done to identify which patients have dyslipidemia so we consider that those who are known case of dyslipidemia are dyslipidemic and the other are not. Third, Accessibility of patients' records was limited so there are 51 patients underwent stent implantation during the study period was excluded. Finally, the focus of this study was on definite ST, which might have led to an underestimation of the actual incidence of ST.

Conclusion

The study showed a high prevalence of stent thrombosis. With the majority is acute stent thrombosis followed by sub acute and late stent thrombosis and very late stent thrombosis, respectively.

Moreover, this study identified several important risk factors for ST. Diabetes mellitus, renal dysfunction, complex lesion (ostial or bifurcation lesion), dissection of the coronary vessel, presence of residual thrombus, and concomitant malignant disease were the strongest risk factors for ST.

Conflict of interest statement

All authors have no conflicts of interest to declare.

References

1. Camenzind, E., Steg, P.G., Wijns, W. Stent thrombosis late after implantation of first-generation drug-eluting stents: a cause for concern. (2007) *Circulation* 115(11): 1440-1455. [Pubmed](#) | [Crossref](#) | [Others](#)
2. Lagerqvist, B., James, S.K., Stenestrand, U., et al. Long-term outcomes with drug-eluting stents versus bare-metal stents in Sweden. (2007) *N Engl J Med* 356(10): 1009-1019. [Pubmed](#) | [Crossref](#) | [Others](#)
3. Van Werkum, J.W., Heestermans, A.A., de Korte, F.I., et al. Long-term clinical outcome after a first angiographically confirmed coronary stent thrombosis: an analysis of 431 cases. (2009) *Circulation* 119(6): 828-834. [Pubmed](#) | [Crossref](#) | [Others](#)
4. Wenaweser, P., Daemen, J., Zwahlen, M., et al. Incidence and correlates of drug-eluting stent thrombosis in routine clinical practice. 4-year results from a large 2-institutional cohort study. (2008) *J American Coll Cardiol* 52(14): 1134-1140. [Pubmed](#) | [Crossref](#) | [Others](#)
5. Lagerqvist, B., Carlsson, J., Frobert, O., et al. Stent thrombosis in Sweden: a report from the Swedish coronary angiography and angioplasty registry. (2009) *Circ Cardiovascular Interv* 2(5): 401-408. [Pubmed](#) | [Crossref](#) | [Others](#)
6. Kedhi, E., Joesoef, K.S., McFadden, E., et al. Second-generation everolimus-eluting and paclitaxel-eluting stents in real-life practice (COMPARE): a randomised trial. (2010) *Lancet* 375(9710): 201-209. [Pubmed](#) | [Crossref](#) | [Others](#)
7. de la Torre Hernandez, J.M., Alfonso, F., Gimeno, F., et al. Thrombosis of second-generation drug-eluting stents in real practice: results from the multicenter Spanish registry ESTROFA-2 (estudio español sobre trombosis de stents farmacológicos de segunda generación-2). (2010) *Cardiovasc Interv* 3(9): 911-919. [Pubmed](#) | [Crossref](#) | [Others](#)
8. Van Werkum, J.W., Heestermans, A.A., Zomer, A.C., et al. Predictors of coronary stent thrombosis: the Dutch Stent Thrombosis Registry. (2009) *J Am Coll Cardiol* 53(16): 1399-1409. [Pubmed](#) | [Crossref](#) | [Others](#)
9. Chua, S.K., Hung, H.F., Wang, J.H., et al. Incidence, Predictors and Outcomes of Subacute Stent Thrombosis following Primary Stenting for ST-elevation Myocardial Infarction. (2010) *J Formos Med Assoc* 109(6): 430-437. [Pubmed](#) | [Crossref](#) | [Others](#)
10. Iakovou, I., Schmidt, T., Bonizzoni, E., et al. Incidence, predictors, and outcome of thrombosis after successful implantation of drug-eluting stents. (2005) *JAMA* 293(17): 2126-2130. [Pubmed](#) | [Crossref](#) | [Others](#)
11. Mehran, R., Baber, U., Steg, P.G., et al. Cessation of dual antiplatelet treatment and cardiac events after percutaneous coronary intervention (PARIS): 2 year results from a prospective observational study. (2013) *Lancet* 382(9906): 1714-1722. [Pubmed](#) | [Crossref](#) | [Others](#)
12. Rondina, M.T., Muhlestein, J.B. Early initiation of statin therapy in acute coronary syndrome: a review of the evidence. (2005) *J Interv Cardiol* 18(1): 55-63. [Pubmed](#) | [Crossref](#) | [Others](#)
13. Kimura, T., Morimoto, T., Kozuma, K., et al. Comparisons of baseline demographics, clinical presentation, and long-term outcome among patients with early, late, and very late stent thrombosis of sirolimus-eluting stents: Observations from the Registry of Stent Thrombosis for Review and Re-evaluation (RESTART). (2010) *Circulation* 122(1): 52-61. [Pubmed](#) | [Crossref](#) | [Others](#)
14. de la Torre-Hernandez, J.M., Alfonso, F., Hernandez, F., et al. Drug-eluting stent thrombosis: results from the multicenter Spanish registry ESTROFA. (2008) *J Am Coll Cardiol* 51(10): 986-990. [Pubmed](#) | [Crossref](#) | [Others](#)
15. Park, K.W., Hwang, S.J., Kwon, D.A., et al. Characteristics and predictors of drug-eluting stent thrombosis: results from the multicenter 'Korea Stent Thrombosis (KoST)' registry. (2011) *Circ J* 75(7): 1626-1632. [Pubmed](#) | [Crossref](#) | [Others](#)
16. Iqbal, J., Sumaya, W., Tatman, V., et al. Incidence and Predictors of Stent Thrombosis: a Single-Centre Study of 5,833 Consecutive Patients Undergoing Coronary Artery Stenting. (2013) *EuroIntervention* 9(1): 62-69. [Pubmed](#) | [Crossref](#) | [Others](#)

Submit your manuscript to Omega Publishers and we will help you at every step:

- We accept pre-submission inquiries
- Our selector tool helps you to find the most relevant journal
- We provide round the clock customer support
- Convenient online submission
- Thorough peer review
- Inclusion in all major indexing services
- Maximum visibility for your research

Submit your manuscript at



<https://www.omegaonline.org/submit-manuscript>