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Clinical

Clinical characteristics, angiographic findings, and one-year outcome of 101 consecutive stent thrombosis cases in British Columbia

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ABSTRACT

Background: Stent thrombosis (ST) is rare, but is associated with significant morbidity and mortality.
Methods: We analyzed data from the British Columbia (BC) Registry from April 2011–January 2012.
Results: 101 ST cases were reported and verified. Based on timing, ST was considered early (≤30 days) in 35.6%, late (>30 days–1 year) in 17.8% and very late (>1 year) in 46.5%. The majority (68.5%) presented with STEMI, and the remaining with non-STEMI (31.5%). Most vessels were functionally occluded (TIM1 flow grade ≤1 in 67.1%). Thrombus burden was high (TIMI thrombus grade ≥4 in 77.2%). Aspiration thrombectomy was performed in 41% of cases. New stents were implanted in 62.4% cases. Intra-coronary imaging was low (11%). At the original stent implantation, STEMI was the clinical presentation in 39.6%, the lesion was complex in 62.1%, and thrombus was visualized in 23.0%. Prognosis after ST was unfavorable with high mortality (11.9% at 30 days and 16.8% at one year), and further revascularization (5.0% repeat PCI and 6.9% coronary artery bypass graft surgery). Early ST was associated with worse clinical outcome compared to late/very late ST: 30-day mortality at 22.2% versus 6.2% ($p = 0.02$), and 1-year mortality at 27.8% versus 10.8% ($p = 0.05$).
Conclusions: In this prospective registry from BC, all ST presented with myocardial infarction, and the majority was treated with emergency PCI. Additional stents were commonly implanted with infrequent use of intracoronary imaging. Mortality rate was higher for early ST in comparison with late/very late ST. A comprehensive approach should be developed to treat this difficult complication.

1. Introduction

Intra-coronary ST is a low frequency event, reported to occur in 1% of patients within the first 30 days following PCI, 0.6% per year in the subsequent years for the first-generation drug eluting stents, and 0.2% per year for the newer second-generation stents [1]. This condition is associated with a poor prognosis [2,3] with mortality rates approaching 18% during the index hospitalization and 25% at 1 year [4,5]. ST is also associated with significant morbidity with more frequent repeat PCI or coronary artery bypass graft surgery (CABG). Several studies have identified a number of clinical, pharmacologic, angiographic, and procedural risk factors for ST. [6–8] Recognition of such risk factors should help prevent ST and optimize treatment. Published literature suggests significant variation in the management of patients with ST between centers and operators. The real-world data from the BC province registry provides a cross-sectional view regarding epidemiology, risk factors and management in patients with ST in the contemporary era.

2. Methods

2.1. Study design and population

BC is the most western province along the pacific coast of Canada with a population of 4.61 million (2014). There are 5 hospitals in BC that perform all the invasive cardiac procedures including coronary angiography, PCI, and CABG. Cardiac Services BC (CSBC) Registry is a government-sponsored data bank, which prospectively collects demographic, procedural and clinical information on all invasive coronary procedures since 1994. However, information on ST was not specifically categorized and recorded at the time of angiography or PCI. In view of

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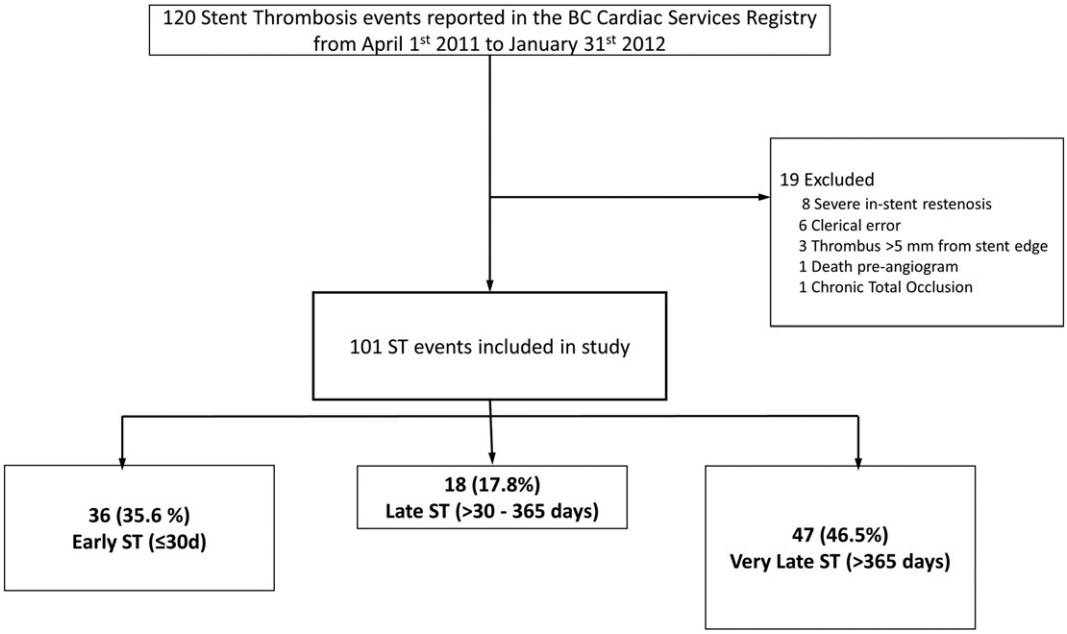

Fig. 1. Study population. Abbreviations: BC = British Columbia; ST = stent thrombosis.

this shortcoming, an additional mandatory data field for ST was added to the registry in April 2011 (yes, no, or not applicable - no prior stent). In this cross-sectional study, we analyzed data from the CSBC Registry that were collected over a 10-month period (from April 2011 to January 2012). Angiographically documented definite ST cases were reported with clinical and procedural details. Follow-up data including repeat angiography, PCI, and CABG were collected. Mortality information was obtained from BC vital statistics. Repeat admission with myocardial infarction was obtained from the provincial Data Abstract Database (DAD). All coronary angiograms were retrieved and reviewed independently to verify the correct diagnosis of ST. Detailed angiographic and procedural characteristics were collected for the initial index procedures and the subsequent ST events.

2.2. Angiographic analysis and definitions

The Academic Research Consortium (ARC) criteria of definite ST were used. Thus, "definite ST" was defined as the angiographic documentation

Table 1
Baseline characteristics at time of index PCI.

Variable	All ST n = 101 (100%)	Early ST n = 36 (35.6%)	Late ST n = 18 (17.8%)	Very late ST n = 47 (46.5%)	p-Value
Age, years ± SD	64.2 ± 11.9	64.4 ± 11.4	64.6 ± 12.0	63.8 ± 10.9	0.96
Males	77 (76.2%)	26 (72.2%)	14 (77.8%)	37 (78.7%)	0.78
Body mass index (BMI) ± SD	27.5 ± 5.3	26.9 ± 4.0	30.7 ± 7.6	26.7 ± 4.8	0.017
Diabetes	37 (36.6%)	16 (44.4%)	10 (55.6%)	11 (23.4%)	0.026
Hypertension	64 (63.4%)	21 (58.3%)	16 (88.9%)	27 (57.4%)	0.046
Current smoker	27 (27.3%)	12 (33.3%)	3 (16.7%)	12 (26.7%)	0.42
Prior CVA	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	NA
Dialysis	1 (1.0%)	0 (0.0%)	1 (5.6%)	0 (0.0%)	0.9
History of CHF	8 (7.9%)	4 (11.1%)	2 (11.1%)	2 (4.3%)	0.45
Prior CABG	15 (14.9%)	4 (11.1%)	3 (16.7%)	8 (17.0%)	0.73
Prior PCI	39 (38.6%)	9 (25.0%)	9 (50.0%)	21 (44.7%)	0.10
Prior MI	50 (49.5%)	12 (33.3%)	11 (61.1%)	27 (57.4%)	0.052
No previous ST	95 (94.1%)	34 (94.4%)	18 (100.0%)	43 (91.5%)	0.43
Previous ST, at different segment	2 (2.0%)	1 (2.8%)	0 (0.0%)	1 (2.1%)	0.78
Previous ST, at same segment	4 (4.0%)	1 (2.8%)	0 (0.0%)	3 (6.4%)	0.45
Indication for procedure					
Angina	17 (16.8%)	5 (13.9%)	4 (22.2%)	8 (17.0%)	0.74
CHF	5 (5.0%)	4 (11.1%)	1 (5.6%)	0 (0.0%)	0.068
STEMI	40 (39.6%)	14 (38.9%)	3 (16.7%)	23 (48.9%)	0.058
Shock	5 (5.0%)	3 (8.3%)	1 (5.6%)	1 (2.1%)	0.43
Extent of CAD					
1VD	34 (33.7%)	8 (22.2%)	6 (33.3%)	20 (42.6%)	0.15
2VD	43 (42.6%)	14 (38.9%)	7 (38.9%)	22 (46.8%)	0.72
3VD	24 (23.8%)	14 (38.9%)	5 (27.8%)	5 (10.6%)	0.01
LM disease	7 (6.9%)	3 (8.3%)	0 (0%)	4 (8.5%)	0.44
SVG disease	8 (8%)	1 (2.8%)	2 (11.1%)	5 (10.9)	0.35
LV ejection fraction, % ± SD	51.4 ± 13.1	49.6 ± 15.5	51.5 ± 15.8	53.3 ± 8.6	0.81

Values are n (%) or mean ± SD (standard deviation).
Abbreviations: CABG: coronary artery bypass grafting; CAD: coronary artery disease; CHF: congestive heart failure; CVA: cerebrovascular accident; LM: left main; LV: left ventricle; MI: myocardial infarction; PCI: percutaneous coronary intervention; ST: stent thrombosis; STEMI: ST elevation myocardial infarction; SVG: saphenous venous graft; VD: vessel disease.